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MINING AND MINERAL PROSPECTS IN
NORTHERN MANITOBA

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Northern Manitoba Bulletins

Mining and Mineral Prospects in Northern Manitoba

BY

R. C. WALLACE

PUBLISHED BY AUTHORITY OF GOVERNMENT OF MANITOBA

OFFICE OF COMMISSIONER OF NORTHERN MANITOBA
The Pas, Manitoba

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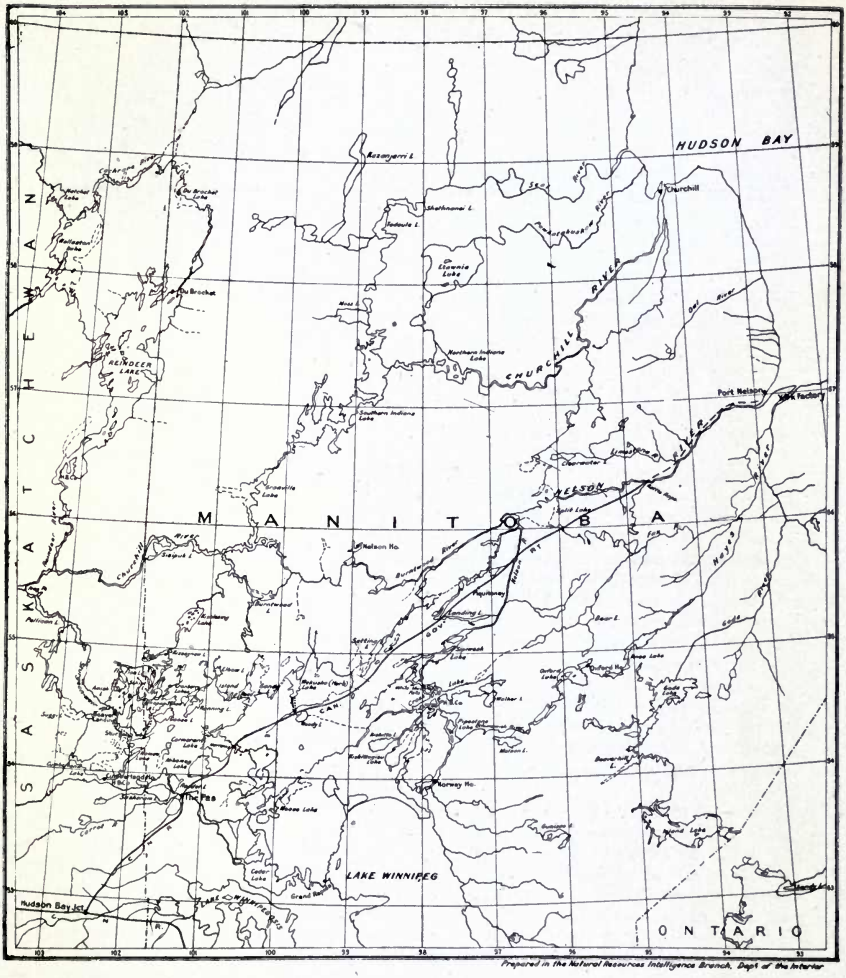

NORTHERN MANITOBA

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CHAPTER I.

INTRODUCTORY

Scope of Bulletin

The purpose of this bulletin is to give a short description of the mineral deposits, in so far as they have been discovered and developed, in the territory which was added to the Province of Manitoba in the year 1912. Although two historic routes of the fur traders lie within this territory—the Hayes River route from York Factory to Norway House, and the Saskatchewan River route from Grand Rapids to Cumberland House, the latter post situated on the Saskatchewan side of the provincial boundary line—there has been comparatively little travel with the object of discovering mineral wealth apart from the main waterways. It must therefore be understood that the bulletin is preliminary in its scope, and cannot aim at any measure of completeness. It is designed to serve as a practical guide to the prospector and mining corporation, and with this end in view the strictly scientific aspect of the subject is subordinated to the economic issues. The connection between the scientific and economic phases is however so intimate that the former cannot be eliminated entirely from the discussion; and there will be found in smaller print throughout the bulletin paragraphs dealing more fully with the purely geological features of the various mineral deposits.

Historical Aspect

Northern Manitoba comprises that territory which lies north of Township 44 and south of Latitude 60°, within the Province of Manitoba. The extent of the territory is approximately 178,100 square miles, while the total area of Manitoba is 250,000 square miles. By this extension to its boundaries, Manitoba is provided with a seaboard, the value of which for trade purposes can only be demonstrated when railway communication to Hudson Bay is completed, and a regular steamboat service is in operation from the railway terminus to the ports of Eastern Canada and of Europe. The territory has a historic significance owing to the fact that Churchill and York Factory were for two centuries important posts of the Hudson's Bay Company, and through York Factory came all the goods and supplies for the western posts of the Company. The old trade route from York Factory up the Hayes River, down the Echimamish to the Nelson River, and thence to Norway House, was a commercial highway of great importance up to the time when communication was made possible by railway to the newly settled west. It is both interesting and significant that there will again be established an import and export trade at a port only a few miles distant from York Factory, and that a highway of commerce will in a few years be in operation almost parallel to the old route. The exports will be western grain, not northern fur. The vehicle of transportation will be the railway car, not the York boat or canoe. The circumstances are indeed changed; but the commercial sagacity of the old traders is only the more completely vindicated thereby.

Historically interesting as well is the lower section of the Saskatchewan River, from Cumberland House to Grand Rapids. It was on account of the activity of the fur traders from Eastern Canada on the Lower Saskatchewan River, that the Hudson's Bay Company was compelled to abandon its policy of maintaining posts exclusively on the coast, and Samuel Hearne was sent west to establish posts inland. Thus was Cumberland House built at a strategic position on the river in 1774. From that time onwards until the amalgamation of the Northwest Company with the Hudson's Bay Company in 1821, this water route was doubtless the scene of many wordy battles, as the rival companies used the same route to Lake Winnipeg. From this point the furs of the Hudson's Bay Company were sent northward to Norway House, and so to Hudson Bay, while the Northwest Company used the Winnipeg River route across to the Great Lakes and thence to Eastern Canada.

It is not however the purpose of this bulletin to discuss the early history of the district, except in relation to mineral development. There is appended to the bulletin a bibliography of the books, memoirs, and papers which have been published with reference to the mineral deposits in the territory known as Northern Manitoba, or in which extended re-

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ference is made to the occurrence of mineral deposits. Wh le many of the early explorers give considerable space to the descriptions of mineral occurrences, practically all the detailed investigations have been carried out by officers of the Geological Survey of Canada, to whom also, and to the land surveyors of the Department of the Interior, all the mapping of the districts which has yet been completed is to be credited, with the sole exception of the coast line of the Bay. North of the Churchill River the territory is yet unmapped. E. L. Bruce and F. J. Alcock of the Geological Survey are responsible for practically all the detailed mapping in the mineral belts that it has yet been possible to accomplish.

The mineral properties which are described in the following pages have been examined by the writer, with the exception of those properties where acknowledgment is made of descriptions from the pen of other writers. It is not the aim to describe any property in great detail, or to give any indication of values such as can only be obtained from careful sampling or from mill tests. The aim is rather to give so clear a description of the surface features and development work that those who are interested in mining development in the district may obtain an accurate conception of the present status of the industry.

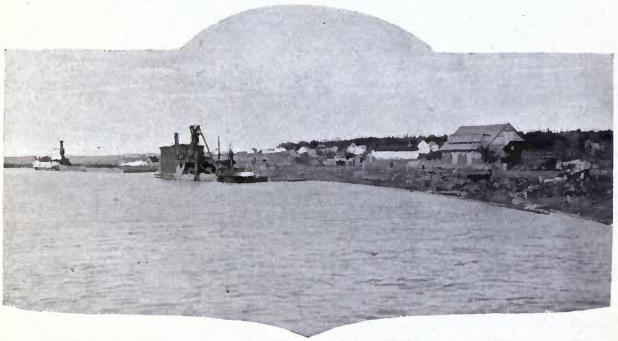
Poling Down Goose River

CHAPTER II.

GEOLOGICAL FEATURES

Volcanic Activity

The main features of the volcanic geological history of Northern Manitoba may be sketched in broad lines. The earliest stage was the outflow of basaltic lava over probably all the southern part, and possible the whole, of the area, on a surface which has been subsequently so much altered that it cannot with certainty be identified to-day. Subterranean activity then took place, the lower levels of the lava flows being cut by acid intrusives which show on the degraded surfaces today as quartz porphyry veins and sills. Then rivers and streams began to do their work, and lava flow and porphyry were worn down to pebble and sand and were deposited in out-wash fans and in shallow lakes as beds of sandstone (now altered to quartzite) and conglomerate. Elevation and erosion again took place, and again sedi-



Cumberland House, showing Government Dredge and Steamboat City of Prince Albert

ments were laid down. Later, subterranean activity took place on a stupendous scale, granites invaded the overlying sediments and lavas, which were intensely crumpled and folded during the process. Then followed a long period of planing down by the action of the atmosphere and running water, to the extent that the underlying granites were exposed over wide areas, and the earlier lavas and sediments were removed except where the folds were abnormally deep. There remains today in the exposures of the Precambrian—a comprehensive term to cover the period in which the above described processes were in being—in Northern Manitoba only a few portions of the earlier lavas and sediments, surrounded by extensive areas of granite and porphyry, which in themselves in all probability represent igneous formations of different ages. A very special interest attaches to such areas of greenstone and of sediment, for in them is found the veins and sheared zones in which occur the ores of gold, silver, copper, lead and zinc, to which the prospectors and mining men are now turning their attention. Such areas occur in a somewhat continuous belt from Athapapuskow Lake eastwards to Setting Lake, with isolated patches at Wintering Lake and Pipe Lake; at Pipestone and Cross Lake on the Nelson River, on the Echimamish River, on Oxford and Knee Lakes on the Hayes River, and in irregular patches in the basins of Gods and Island Lake and on Gods River. Doubtless other areas of greenstone will be found when prospectors turn their attention to more northerly and easterly areas. There are indications that the upper waters of the Fox and Deer Rivers, and the Churchill River in the vicinity of Granville Lake, will reveal to detailed examination greenstone areas in which prospecting may yet be successful. While the country north of the

Churchill River, and between the Churchill and Burntwood Rivers is generally mapped as granite, there has been no geological investigation in this region to determine whether within this granite complex there may lie greenstones and sedimentaries on the waterways which have been provisionally mapped from descriptions by Indians and travellers whose interests were other than geological.

Owing to the isolated occurrences of Precambrian formations throughout the north, it is hazardous to attempt a correlation of the various divisions in the widely separated belts. For this reason Bruce has adopted a local nomenclature in the Athapapuskow district. Broadly speaking, there is a very close resemblance between the greenstones in the northern Manitoba areas and the formation generally mapped as Keewatin elsewhere. The conglomerates and other sediments may finally be correlated with definite divisions of the Huronian elsewhere, while the later granites, though undoubtedly representing a complex series, may be fairly safely relegated to the same general period of activity as is elsewhere classified as Algoman. In only one district have the Precambrian formations been studied in any detail—that belt which stretches eastwards from Amisk Lake in Saskatche-

Flin Flon Property, looking north (photograph taken from "horse")

wan to Wekusko Lake in Manitoba. The memoir by Bruce ① and the reports by Bruce ③ and Alcock ②, while they indicate the extent of the problems yet unsolved, outline a definite succession for that district, which may be generalized as follows:

Precambrian: Granite, hybrid granite, and gneiss
Intrusive Contact:
Conglomerate, arkose, greywacke
Unconformity: (?)
Slate.
Unconformity:
Granite Porphyry.
Intrusive Contact:
Sedimentary Gneisses
Volcanic Flows.

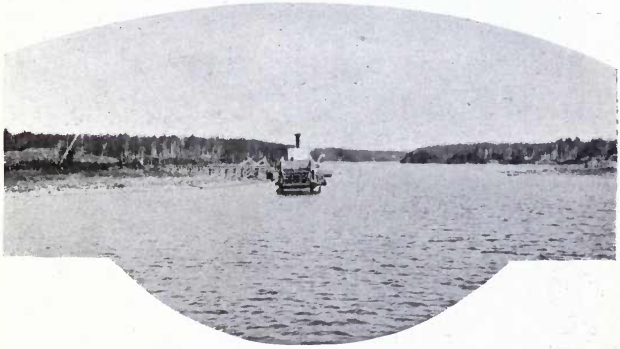
Whether the earlier granite prophyry played any considerable part in introducing the metal-bearing solutions is not known, but the evidence points to the later granites, or some phase of the eruptive activity which produced the later granites, as factors of great importance in this connection. In many instances it is possible to trace a direct connection between the gold-bearing quarts veins and the fresh red granite which represents the last stage of volcanic activity. While the connection between the sulphide bodies and the granite is not so clearly established, the field evidence supports the hypothesis that the sulphides have been precipitated at a late stage in the same period of volcanic activity.

Limestone Building

A long period of time elapsed between the cessation of volcanic action and the building up of the limestone which overlies the granite complex in the northeast and southwest districts of Northern Manitoba. During this period the land surface was planed down to a stage of low relief approximating to the level surface which characterizes the granite country

① Amisk-Athapapuskow Lake District. Memoir 105. Geological Survey Canada, 1918.
③ Summary Report, Geological Survey of Canada, 1914, 1915, 1916, 1917, 1918.
② Summary Report, Geological Survey of Canada, 1917, 1918.

at the present time, where elevations of 200 feet above the average surface level are exceptional. The eroded surface was then lowered beneath sea level, and at the bottom of the sea there was deposited successive layers of calcareous ooze, made up chiefly of the fragments of sea shells. There were doubtless successive elevations, and lowerings of level, though not of sufficient magnitude to disturb the level of the beds, and thus were deposited in succession the limestones of Ordovician, Silurian and Devonian age. While there is no direct evidence to prove that this limestone was laid down over the whole surface from the Saskatchewan River to Hudson Bay, the similarity of the fauna, as shown by the fossils which the rocks have thus far yielded, would indicate that the sea was, from time to time at least, continuous. On final elevation, the beds were probably arched along an axis extending from northwest to southeast, and the top of the arch has been eroded, leaving the limestones along the flanks to the southwest and northeast. On the Hudson Bay slope they are found along the Nelson and Churchill rivers, but are covered by clay on the lower reaches of these rivers. They probably extend underneath the waters of Hudson Bay. On the southwest, the limestone escarpment, which is very pronounced on the west



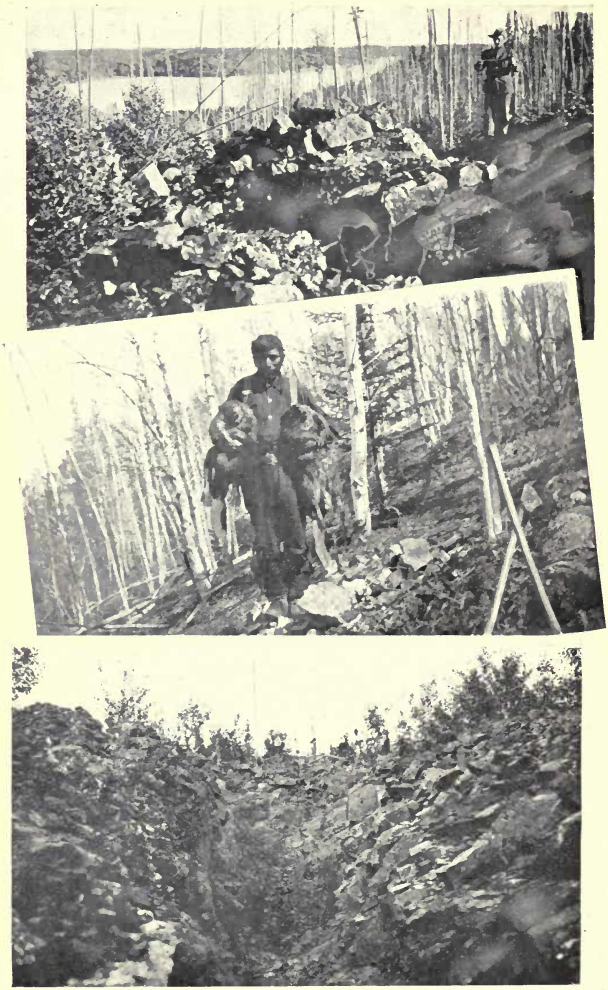
Steamboat City of Prince Albert at Sturgeon Landing

shores of Lake Winnipeg, continues in a westerly direction along the drainage valley of the Grassy River, showing as a rule a somewhat precipitous front to the Precambrian rock country to the north. Along this escarpment, and southwards almost to the Saskatchewan River, the formation is the somewhat reddish magnesian limestones of Ordovician age: on the lower reaches of the Saskatchewan River, Silurian dolomites are found; while on the splendidly exposed cliffs of Dawson Bay, Lake Winnipegosis, the harsh magnesian limestones and the pure shell limestones of Devonian age make their appearance, the traveller passing over younger and still younger beds as he pursues his southward journey. On the northern flank of the arch a similar succession is to be found, though in this case the younger beds appear as one travels northward, and the Devonian series, which presumably underlies the deep clays of the coastal region, has not yet been found exposed.

In contrast to the hummocky relief of the Precambrian surface, the limestone area is characteristically flat. On its surface rest shallow lakes, drained by sluggish rivers. The chief relief element is the occasional occurrence of sharp scarps of limestone, caused by the action of an earlier stream system undermining the softer interlaminated clay beds, and leaving the harder limestone standing in somewhat sharp relief. Here and there such scarps are seen flanking old erosion valleys, like the ramparts of an old-time moat.

Shale Deposition

The limestone series represents the youngest rock system in Northern Manitoba with the exception of a small area of shales in the southwest corner of the territory, which forms the northeastward extension of the Pasquia Hills. The shales were laid down in shallow inland seas at a period in the geological succession long subsequent to the Devonian,



1—Pit on Sunbeam Claim, Hook Lake.
2—Jacob Cook, Discoverer of Red Rose Claim.
3—Cross Trench, Chica Property, Pineroot River.

which marked the conclusion of the limestone building era. As far as the Northern Manitoba map area is concerned, they represent early Cretaceous sedimentation, though the uppermost beds of the Pasquia Hills were laid down in late Cretaceous or early Tertiary times. The shales doubtless extended much further north than their present boundary; how far, it is not possible to state, as no isolated areas of shale have yet been found on the limestone or granite surface. Even at the present time, erosion is proceeding very rapidly, the streamlets which flow eastwards from the Manitoba escarpment—which marks the eastern edge of the shales in the southern part of the Province—cutting deeply into soft rock and forming vertical walls which are in many places 30 feet high.

Glacial Action

Over granite, limestone and shale alike are to be found the relics of the ice period which represents the last chapter in the geological history. The ice sheet advanced south-westwards from its gathering ground west of Hudson Bay, and scoured bare the weathered surfaces of granite and limestone. There followed recession and readvance—it may be repeatedly. On one such readvance, the limit of the ice front was the Pas ridge, which represents the terminal moraine deposited by the ice as it pushed its way forward to this position and then began its retreat. The drainage was northwards then as now, and the water was dammed back by the ice-front to form a lake in which was deposited the silt that was carried in by the streams which deployed into this lake. Thus was formed the clay belt which extends northwards, as shown by McInnes' map, to South Indian Lake, and eastwards to the Nelson River, and has been estimated to cover an area of 10,000 square miles. The Hudson Bay Railway cuts through the centre of this clay region, which will yet prove of agricultural value when well drained. The natural drainage is very imperfect, and as a consequence the soil where undrained is too cold to admit of successful farming. As the lake receded, beaches were formed. The sand and gravel ridges which were formed as beach deposits on the western shores of the glacial lake, are clearly differentiated today, not only by their higher elevation, but by the growth of jackpine which is seldom to be seen in Northern Manitoba save on these gravel ridges alone.

Since the glacial period the surface features have been but slightly modified. A drainage system has gradually evolved on the clay-covered surface, but it is yet very primitive, and leaves practically untapped considerable areas apart from the principal waterways. The surface is to a large extent covered by muskeg or swamp, which is being rapidly infilled with vegetation, but which will remain unavailable for agriculture until the natural drainage matures, or artificial drainage is invoked. The existing rivers have cut their way through the covering of clay to the solid rocks, but have not yet cut deeply into the rock itself. In short, the changes which have taken place since the ice receded from Northern Manitoba are practically negligible when measured by the standard of geological time.

Beaver Dam, north end of Copper Lake

CHAPTER III.

THE HISTORY OF MINING DEVELOPMENT

Early Exploration

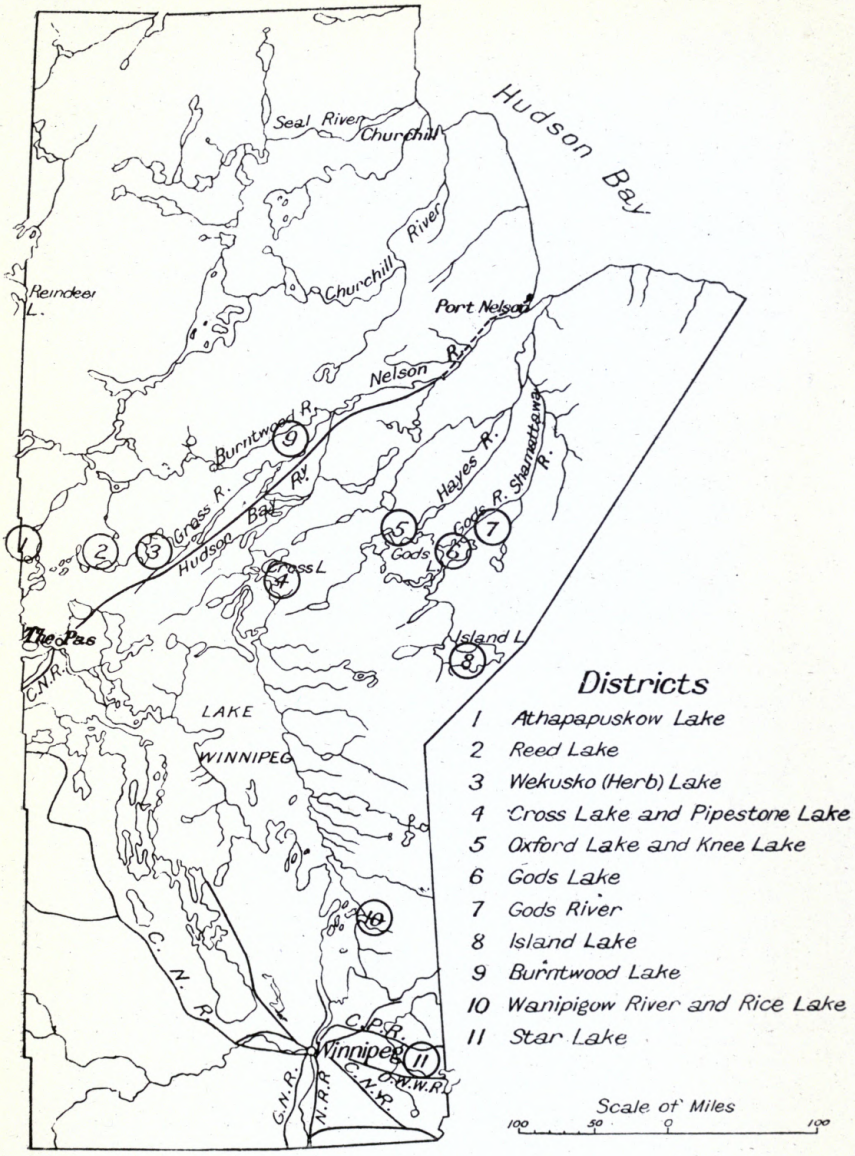
The stage as yet reached in mining development in Northern Manitoba is not very advanced. A chapter on the history of development is therefore of necessity a short one. It is well, however, to narrate the stages of development as they have occurred, in order that the record may be accessible, as a guide to future operations.

Northern Manitoba was, in the earlier period of British trade development in the West, pre-eminently the fur-producing territory. Such it remained from the latter years of the seventeenth century until the closing years of the nineteenth century. For two long centuries the only changes wrought by the white man on this territory were the erection of trading posts, first on the coastline and later on the inland waterways, and the construction of York boats with which the better to transport supplies from York Factory to the inland posts. There was, to a certain extent, agricultural development before the end of the ninteenth century, it is true. The Parliamentary Committee which was instructed to investigate the economic possibilities of the Northwest in 1857, reported to the British Government that a small agricultural settlement was visited on the Saskatchewan River below Cumberland House, where cereals were successfully grown and cattle were raised. On enquiry in the district, it is found that the reference was to a settlement on The Pas Ridge, where the Hudson's Bay Company buildings now stand. At this settlement Antoine Constant, grandfather of Chief Constant of The Pas Indian band, grew barley and his son successfully raised wheat. At practically all the Hudson's Bay Company posts in the district, even at Churchill, gardens had continuously, or from time to time, been cultivated, and good root crops had been raised, while occasionally oats and barley and even Indian corn had been harvested. Such agricultural ventures were, however, more by way of experiment than with the object of initiating an agricultural industry.

The evidence obtained during the Parliamentary inquiry of 1748-49 shows that the officials of Fort Churchill were long aware of the existence of native copper in the far north before any action was taken to investigate the extent of the deposits. Only at the instance of Governor Norton, who was impressed by the tales of the Indians in 1768, was the Company induced to send Samuel Hearne on his notable journeyings to the "far-off Metal River," the Copper Mine River. At the same inquiry Alexander Browne, surgeon at Churchill, gave evidence that a red earth, obtained about 36 miles south of the Churchil River, reacted like cinnabar. Dr. Browne and the Governor, who was present at the experiments to test the nature of the material, both remarked that it was surprising that the Company did not do something to follow up these discoveries. It must in fairness be remembered that the policy of the Company was to trade with the Indians, and that there was no sufficient reason to induce them to embark on new enterprises when the old avenues of trade provided a remunerative return for their investment.

The Salt Industry

The earliest mineral industry in this territory, and indeed, in the whole West, was conducted by arrangement with the Hudson's Bay Company. A series of salt springs extends from the Carrot River Valley south-eastwards along the west side of Lake Winnipegosis and Lake Manitoba, and continues beyond the international boundary line. The brine is too weak to make extraction of salt a profitable industry at the present time. From the early years of the nineteenth century, however, and probably for some time previous to that date, salt was manufactured from the waters of these springs, and was supplied to the Hudson's Bay Company's posts and, at a later period, to the Red River settlement. Until 1876 no salt was used in the western settlements but that which was obtained by somewhat primitive methods of extraction from the salt springs of Manitoba. The operators were "freemen"—former employees of the Company. Shallow evaporating tanks were supplied by the Company. These tanks were supported on pillars two feet above the ground, and a cordwood fire was built underneath the tanks. When the water


Hudson Bay
Seal River
Churchill
Churchill River
Reindeer L.
Port Nelson
Nelson R.
Burntwood R.
Grass R.
Hudson Bay
Hayes R.
Gods R.
Shamattawa R.
Gods L.
Cross L.
Island L.
The Pas
C.N.R.
LAKE WINNIPEG
C. N. R.
C.P.R.
Winnipeg
C.N.R.
O.N.W.R.
C.N.R.
N.R.R.
Districts
1 Athapapuskow Lake
2 Reed Lake
3 Wekusko (Herb) Lake
4 Cross Lake and Pipestone Lake
5 Oxford Lake and Knee Lake
6 Gods Lake
7 Gods River
8 Island Lake
9 Burntwood Lake
10 Wanipigow River and Rice Lake
11 Star Lake
Scale of Miles
100 50 0 100

had evaporated, the salts were scraped clean from the tank, and the process was repeated. While the salt was somewhat reddish in color, and was undoubtedly very deliquescent owing to the presence of calcium chloride, it was generally used by the residents of the Red River settlement until refined salt could be imported from the East. There are still to be found the evidences of a former salt industry at many places on the shore of Lake Winnipegosis. On Salt Peninsula on Dawson Bay, which is just on the boundary of Northern Manitoba territory, one of the largest flows from any single salt area is found; and here, it would seem, a considerable amount of salt was produced during the earlier half of last century.

Amber

Another non-metallic mineral which attracted some attention was the so-called amber which is found in the clay in the western bay of Cedar Lake. Before Tyrrell's visit to Cedar Lake, the Hudson's Bay Company officials at Chemahawin Post had made some investigations on the occurrence of this material. A specially constructed separator was installed to win the amber from the beach clay and a considerable amount of material

South End of Flin Flon Property

was obtained. Apparently it was found only in this single locality, and chiefly in the clay which was scraped clean by the action of the waves. It occurs in lumps varying in size from a pea to a hen's egg, is amber colored, translucent and very brittle. A sample was analyzed by Dr. Harrington of McGill University for the Geological Survey of Canada. The analysis showed that the percentage of succinic acid was smaller than in a true amber, and the name Chemahawinite—from the Hudson's Bay Company's post on the west side of Cedar Lake—was given to the mineral by Harrington. In Hudson's Bay Company circles in Winnipeg and elsewhere, specimens of this mineral are frequently to be seen, in some instances adapted to decorative use. From the economic standpoint this mineral occurrence is probably valueless but it is of interest in showing that the conditions for the preservation of resin from conifers in the Saskatchewan Valley were similar to those which gave rise to the valuable amber beds on the south shores of the Baltic Sea.

Prospecting for Metals

The history of the prospecting and development of the metallic deposits in Northern Manitoba is a very recent episode. It is of interest that the minerals which attracted most attention in the early explorations—haematite and magnetite—are still unworked, and are probably economically of relatively little value for some time. Dr. Edwards, the surgeon of the Red River Settlement, collected specimens of iron ore from Knee Lake in 1812, and Sir John Franklin, in the account of his first overland journey to the Arctic Seas, described rather fully the behaviour of the compass in the neighborhood of an island one-half mile from the knee of Knee Lake. Sir John Richardson's description in the same journal is sufficiently detailed to show that the ore occurs in a typical banded formation such as is frequently to be found interbanded with sediments. This was substantiated by Dr. Bell,

who, in 1877, reported on the occurrence, and another occurrence on Knee Lake, at the mouth of Trout River. On no ore of this type, though there are many occurrences in Pre-cambrian rocks in Manitoba, has it yet been found possible to carry on development work.

The earliest prospecting in the mineral belt north of The Pas is vividly described in the following communication from Mr. Hugh Vickers, who can claim the honor of having prospected the territory for a larger number of years than any other man in the country. The communication is quoted in extenso:

"The first expedition having for its object the search for minerals in this district, of which I have any knowledge, was in 1896. In this year a Mr. Loucks, who was farming near Prince Albert, made an expedition as far as Reed Lake where he staked a claim, which assayed $9.00 in gold. About this time the discoveries in the Yukon drew most of the more adventurous prospectors in that direction.

"No more interest seems to have been taken in this district until the discovery of ores containing copper at Lac la Ronge in 1907 or 1908, though some parties may have made trips that produced no results. I think, however, that it was before this date that an American Company attempted to work the amber deposit on Cedar Lake. At this time most of the supplies for Cumberland House, which was the headquarters of the H.B. Co., were floated down the river from Prince Albert in 'flat-boats,' roughly built scows which were broken up for the lumber at the end of the trip, or brought down by the Steamer 'Saskatchewan,' which was built about this time.

"The first two trips I made myself were both from Prince Albert. In the first year I made a trip to File Lake, and in the second staked some claims on the Copper Lake sulphide deposit.

"It must have been about this time, *i.e.*, 1908, that Brunne (after whom the lake adjoining Copper Lake is named) came to the country, and, it was in the same year that I met Richard Woosey and Charles Krug coming in from a prospecting trip, at what is now Sturgeon Landing.

"In these days the chief difficulty of prospecting lay in the fact that it took so long to get in and out of the district. Though the steel was laid from H.B. Junction to The Pas (which was then known as The Pas Mission) the track was only ballasted for eighteen miles and no trains were running, the usual method of travel being by hand-car.

"I retain a very vivid recollection of a trip with a scrip commission under 'Big Bear' McLean. We took three days to reach the Junction and had to send in one of the hand-cars from twenty miles out to obtain more hand-cars, as the ones we had were falling to pieces. The cars we got were not in much better shape, but under the able superintendence of Dr. Stewart of Saskatoon, who was attached to the scrip party, we finally evolved two fairly serviceable machines, and finished our trip safely. I remember also that when we were almost out of grub, Dr. Stewart beheaded eleven prairie chickens with twelve shots from his .303 rifle.

"It was in 1908 or 1909 that I first met Billy Todd (on Beaver Lake), who prospected and trapped for some years, and was drowned in the Grassy River. Dan Mosher and (I think) Jack, also made a trip about this time, and one or two parties came down from Lac la Ronge by way of Stanley, Frog Portage, and Pelican Narrows.

"Woosey, Krug, Brunne, Todd, Rod McLeod and myself, stayed in the country and prospected, whenever the state of our finances allowed.

"In 1911 I made an extensive trip with a Mr. Goldie, looking over the country from Beaver Lake to Little File Lake; and in the following year made a trip from The Pas to Split Lake with W. B. Wright, going in by Cumberland and coming out via the Metati River and Moose Lake.

"This trip was financed by Messrs Hammond and Burroughs, of the Canadian City and Town Properties Ltd., who, as far as I know, were the first parties to go to any considerable expense to explore the country. It was in this year that Geo. Bancroft brought a party from Porcupine to prospect and since then there have always been several parties in the field.

"I might mention that in the early years it was an extraordinary event to meet anyone in this district in the summer except on the H.B. Co. freight routes, *i.e.*, Sturgeon River or the Nelson. All the Indians were at or near the posts or working on the York boats until after the treaty payment in the Fall, when they would begin straggling off to their winter trapping grounds. W. B. Wright and myself travelled 44 days (from Sturgeon River to Split Lake) without seeing a human being.

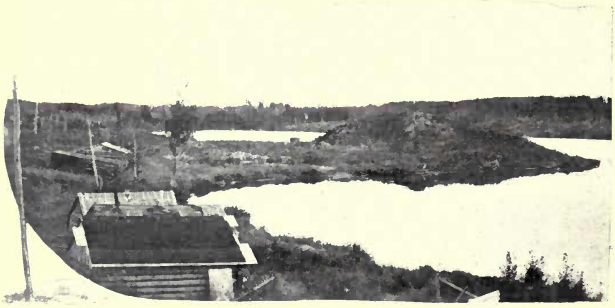
"Jacob Cook and Philip Keddie, of Cumberland, accompanied me on most of my early excursions, and their knowledge of the country was invaluable."

Brunne staked several claims for copper and nickel, but apparently did not record these claims. He also made a rough sketch map of the waterways and lakes which he traversed, part of which territory, north of the Cranberry Lakes, not having been previously

mapped. It would appear, however, that no actual development work was done by Brunne on any of the claims which he staked, the position of which appears on his blue-print.

In 1913 a considerable amount of activity took place in Amisk (Beaver) Lake district in Saskatchewan at the west end of the most important mineral belt thus far developed in Northern Manitoba. Gold was discovered on the northwest side of Amisk Lake by the Mosher-Creighton party and a sudden influx of prospectors took place into the district. A roadway was cut from the northwest end of Sturgeon Lake to Beaver Lake, and a small settlement grew up at Beaver Landing, at the south end of the road, which can be reached by steamboat from The Pas. The amount of staking which took place was altogether out of proportion to the development which the district has witnessed since that time.

During the same season Messrs. Bancroft and Wright made a prospecting trip along the lower waters of the Grass River. They travelled by way of Clearwater Lake and Cowan River to Reed Lake, and thence by Grass River to Wintering Lake, where promising indications were noted. In the following year Messrs Woosey and Hackett, while prospecting on Wekusko (Herb) Lake, discovered the property which is now known as the Kiski-Wekusko group, and thus initiated the activity on Wekusko Lake and vicinity.



Flin Flon Property looking south.

In the summer of 1915 the Mosher-Creighton party, which had been working northeast of Amisk Lake, were guided by information given by an Indian to the Flin Flon Lake district and the Flin Flon ore body was discovered. These claims were recorded late in the summer and very considerable excitement ensued. Later in the same season Messrs. Jackson and Reynolds staked the Mandy property on Schist Lake. The property was taken over by the Tonopah Mining Company, through J. E. Spurr, who was in the district at the time, and work was at once proceeded with. It is a matter of some interest that Mr. Jackson, who actually discovered the property, was taking his first trip as a prospector. He had formerly been engaged as a sub-contractor on the Hudson Bay Railway construction work.

The Copper Industry

Owing to demands created by the war, the price of copper was steadily on the increase, and the Tonopah Mining Company proceeded with active development on the Mandy prospect. A subsidiary, the Mandy Mining Company, was formed. Until the Autumn of 1916 development was confined to surface trenching and diamond drilling, which proved up a body of 100,000 tons of ore, consisting in part of a lens of very high grade chalcopyrite averaging 17% copper, surrounded by a chalcopyrite-sphalerite-pyrite deposit of lower value. It was decided to mine the ore, and a contract was let to C. B. Morgan to haul three thousand tons to Sturgeon Landing during the winter. H. C. Carlisle was in charge of the mine and shortly thereafter G. R. Bancroft was appointed Superintendent of Trans-

portation. Altogether three thousand tons were delivered at Sturgeon Landing by break-up, having been mined by open cut methods. A road had been built during the early winter by the Provincial Government from Sturgeon Landing to Lake Athapapuskow, a distance in all of sixteen miles, and this was sufficiently far advanced to be used as a winter road for the transportation, by wagon, of the ore. During the winter also, machinery for underground development work was installed on the property, and open cut methods were then abandoned. A shaft was sunk at the south end of the chalcopyrite lens, and drifts run, first at the 100-foot level, and later at the 200-foot level. During the winter of 1917 a contract was let for hauling 7500 tons of ore to Sturgeon Landing and in the succeeding winter, fifteen thousand tons were delivered over the same route. In all, over twenty-five thousand tons of chalcopyrite, averaging approximately 18% copper, have been mined, and have been delivered in part at the smelter at Trail, B.C., and are in part in process of transportation from Sturgeon Landing to Trail. The transportation by water, from Sturgeon Landing to The Pas—a distance of one hundred and thirty miles—was taken care of for two seasons by the Ross Navigation Company, but has been handled during the present season (1919), by the Mandy Mining Company, who have taken over the barges and steamboats used by the Ross Navigation Company, and have built additional barges and purchased another steam tug for this purpose.

On the Flin Flon property work was confined to surface sampling and cross-trenching during the first winter after discovery (1915-1916). In March, 1916, two drills were at work, and by July of the same year, six thousand feet of drilling had been done by New York and Boston interests, who, however, failed to reach a satisfactory agreement with the owners. In the spring of 1917, however, certain Toronto interests represented by David Fasken and John H. Black, entered into an agreement with the owners, and diamond drilling was resumed and continued throughout the year and until July, 1918. In all, sixteen million tons of ore have been blocked out, with a probable five to six million to be disclosed by further drilling, representing the section of the ore body from the surface to a depth of nine hundred feet.

The Canadian National Railway Board may build a railway line to the property from The Pas, a distance of eighty-five miles, provided a smelter of two thousand-ton capacity is erected on the property and the necessary power made available for operating the mine and the smelter. Financial conditions due to the prolonged delay in arriving at a peace settlement, and the general labor unrest throughout the world, have made it impossible as yet for the mines to obtain the necessary capital for so large an undertaking, the inception of which will not only initiate a large mining industry, but which will also stimulate the development of lower grade properties throughout the Athapapuskow district. During the latter part of the winter of 1918-1919, a location survey for the proposed railway line was made by J. P. Gordon, who found that the route along the west side of Lake Athapapuskow southwards from the property, and thence across Goose Creek towards The Pas, was preferable from the engineering standpoint to the route eastwards from the property along the north side of Athapapuskow Lake and across the Cranberry portage to the Hudson Bay Railway line.

The discovery of these bodies of copper sulphide ore has stimulated prospecting for copper throughout the district, and occurences of low grade chalcopyrite and bornite have been discovered on the east end of Lake Athapapuskow and on Copper Lake. These will be more fully described in the chapter directed to the mineral properties in the various districts. Generally speaking, the copper-bearing zone, as yet determined by prospecting, is limited on the west side by the Manitoba-Saskatchewan boundary, and on the east side by Sandy Lake, on the Grass River System.

The Gold Fields

Since the discovery of the Kiski property in the summer of 1914, by J. Hackett and R. Woosey, interest in gold-bearing properties has been centered round the Herb (Wekusko) Lake District. A good deal of development work has been done on several properties on the east side and north end of the Lake, more particularly the Rex, Northern Manitoba (Moosehorn), Kiski Wekusko and Dauphin-Elizabeth group. The Rex group

was located by Campbell, Hassett and Moore, and was sold in the late summer of 1916 to the Makeever Brothers, of New York and Boston. Work was at once proceeded with under the engineer of the company, Mr. Walter Neal, and a depth of 80 feet was reached in the main shaft by the Spring of 1917. Mill machinery was then ordered and the mill was installed during the winter of 1917-1918. It was decided to instal a Lane 40-ton mill with amalgamating plates, and two Deister-Overstrom concentrating tables, operated by a 55 h.p. engine. The shaft was sunk to the 100-foot level, and in all some 350 feet of drift have been run on this level. In May, 1918, the plant was ready for operation, and the mill was run continuously until December when the influenza epidemic and the shortage of labor necessitated the closing down of the plant. In all, approximately $27,500.00 was recovered from the plates, the concentrates being stored until a cyaniding plant would be erected. The owners have decided to postpone reopening until underground development will be carried out consistent with the capacity of the mill, in order that the plant may be run on a 24-hour basis.

From the Moosehorn, the property of the Northern Manitoba Mining and Development Company, there was shipped, early in 1917, fifty-seven thousand pounds of ore, which

Mandy Mine and Ore Wagons

gave, on smelter returns, an average of $81.53 per ton. A compressor plant was installed on this property and a working option was later taken on the property by the Makeever Brothers, who control the Rex property. The inclined shaft was continued to the 100-foot level and a sump was continued 25 feet below this level. Short drifts were run north and south from the 100-foot level, and the vein, which varies in width from six inches to eighteen inches, was found to continue practically unchanged at this depth. Work has not yet been resumed on this property.

On the Dauphin-Elizabeth group, controlled by the Pas Consolidated Company, a shaft was sunk vertically for fifty feet by the Makeever Brothers, who had a working option on the property, but which they later dropped.

The Kiski-Wekusko property, which was the first discovery in the district, was taken over in 1917 by a Toronto syndicate, and a shaft sunk to 53 feet. Some difficulty arose in connection with the deal and the work has not been proceeded with further.

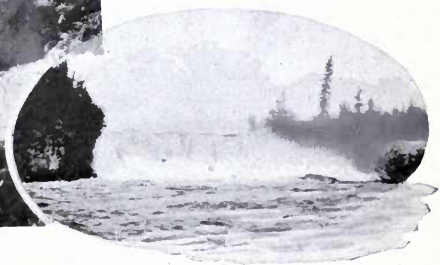
On the other gold-bearing properties throughout the belt, development work has yet been confined to stripping and shallow trenching. Claims have also been staked on Pipestone and Little Playgreen Lake on the Nelson River, and on Knee Lake on the Hayes River route. There has been practically no development work in either district. For a detailed description of the various properties the reader is referred to the chapter which follows.

Transportation

The question of transportation is always a serious problem in northern territory. The railway has already changed the whole transportation situation, but the problem of communication with the railway still remains. In the eastern section of the mineral belt proper, the railway does not cut through the mineral-bearing area, but is only eleven miles distant from the south end of Wekusko (Herb) Lake, which has been the centre of interest in the prospecting for gold. In order to facilitate transportation of machinery and supplies, a wagon road was constructed by the Provincial Government from Mile 82 on the Hudson Bay Railway, to the south end of Herb Lake. The road was surveyed by Mr. J. P. Gordon, and was completed in 1917, and has been kept in repair during the succeeding summers, and provides a fair highway for wagon transport in summer and a good sleigh route in winter. All the machinery and supplies of the camp have been transported across the road and have been carried through to the camps over the ice in winter or, in part, by gasoline launch during the summer.

For the western part of the field the railway has been of relatively little assistance. There is fortunately a good water route, navigable, except during very low water, by steamboat to Sturgeon Landing at the mouth of the Sturgeon River on Namew (Sturgeon) Lake. From this point to Lake Athapapuskow there is a canoe route involving rather heavy portaging. A wagon road was built by the Provincial Government from Sturgeon Landing to Lake Athapapuskow, a distance of sixteen miles, in order to facilitate the transportation of machinery and copper ore. This was completed in 1917 and further work was done on the road in 1918, in order to put a section of the road into shape as a summer road. The road was used in part for ore hauling during the winters of 1917-18 and 1918-19, and has been used more or less intermittently during the summers since completion. During the summer of 1919 navigation was improved in Goose River and Rat Creek by removing the boulders and blasting the limestone ledges which caused obstruction to canoe traffic. This work was done by the Federal Department of Public Works. From Athapapuskow Lake to Schist Lake a winter road was cut by the Mandy Mining Company and has been used for three seasons for the transportation of ore.

Elizabeth Vein looking north. Herb Lake.



Lynx Falls Grass River—a possible source of power for Herb Lake.

CHAPTER IV.

METALLIC DEPOSITS

In only one area in Northern Manitoba has prospecting been carried on at all extensively. That area is, however, fairly large. It extends from the Saskatchewan-Manitoba boundary line eastwards to Wekusko (Herb) Lake, and embraces in a north and south direction the width of the greenstone belt, which forms the basin of the Grass River and continues westwards into Athapapuskow and Schist Lakes. East of Wekusko Lake there is no continuous band of greenstone, but the isolated small bands near the Hudson Bay Railway line have attracted prospectors owing to their accessibility. Such are found on Pipe and Wintering Lakes, on Halfway Lake, and interruptedly as far east as the Manitou Rapids, where the railway crosses the Nelson River. There are other somewhat extensive greenstone areas in Northern Manitoba which have not yet been prospected and on which only a few claims have been staked. Such are the Pipestone and Cross Lake area, and the Oxford and Knee Lake area, and the Island and God's Lake area. These are far removed from railway communication and have not yet received the attention which they would have had were they more easily accessible.

(A) Mineral Belt North of The Pas

This belt extends from Flin Flon Lake, on the Manitoba-Saskatchewan boundary line, eastwards through Schist and Athapapuskow Lakes into the Grass River system at the First Cranberry Lake, and thence eastwards along the basin of the Grass River to a point somewhat beyond Wekusko (Herb) Lake. There is also an isolated area in Pipe Lake and Burntwood River, and smaller bands of greenstone have been prospected in the vicinity of the Hudson Bay Railway. The length of the main belt (east and west) is approximately one hundred miles, with a variable width up to fifteen miles. As a rule the ore occurrences are found in greenstone schist or associated porphyry belonging to the earliest stage of volcanic activity, when such schist or porpyhry has been intruded by the youngest granite eruptions, which are normally fresh and unsheared. The ore deposits fall into one or other of three classes, between which there is no distinct line of demarcation, as not infrequently there is found in the field an easy gradation from one type to another:

(1) Gold in quartz veins which carry sulphide.
(2) Copper-zinc-iron sulphide bodies.
(3) Iron sulphide bodies.

It is probable that the temperature of deposition was the chief factor in determining the character of the deposits, and that from one and the same solutions all three types of deposit were formed at varying distances from the intrusive.

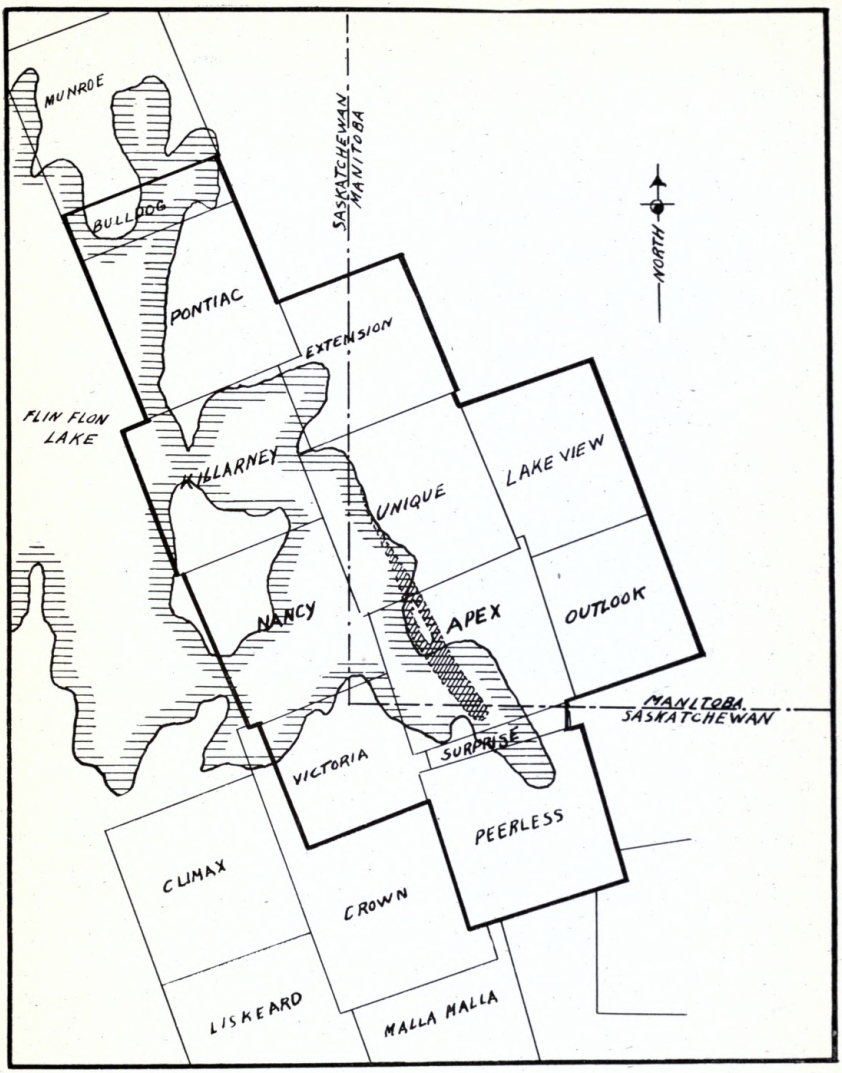
In discussing the various mineral deposits in this area, it will be advisable to deal with them under particular districts. There is, on the whole, a specific predominating type of mineralization in each district, which justifies the classification. It is from the strictly geographical standpoint, however, that the division into districts is of value in dealing with the deposits. From west to east, the districts may be enumerated as follows:

(1) Flin Flon and Schist Lake District.
(2) Athapapuskow Lake District.
(3) Copper and Brunne Lake District.
(4) Herb and Little Herb Lake District.
(5) Pipe Lake, Wintering Lake and Hudson Bay Railway District.

It is not to be understood that the districts are delimited by the lakes which are specifically mentioned in each case. In their vicinity, however, the main discoveries have been made and for that reason they may legitimately serve to give name to the respective districts grouped around them.

(1) Flin Flon and Schist Lake District

This district is the best known, and as yet the most important district in the mineral area. In it occurs the Flin Flon ore body and the Mandy Mine; the former the largest



Group of claims, FLIN FLON Property

Ore Body (Surface extension)

ore body yet prospected in Northern Manitoba; the latter, a mine which has produced from a lens of high-grade chalcopyrite twenty-five thousand tons of ore with an average copper content of over eighteen per cent. Since the discovery of these ore bodies prospecting has been directed mainly to the search for copper sulphides, though values in gold have been obtained in some of the quartz veins in this district.

Flin Flon Property

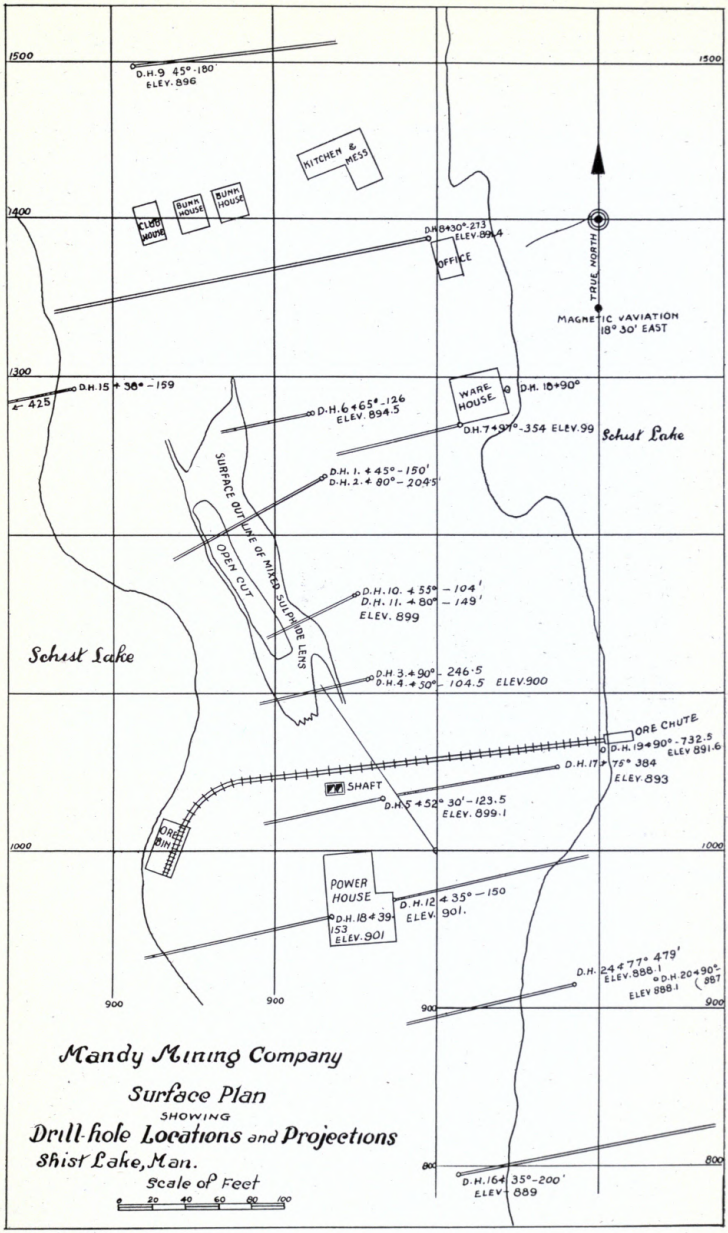
This property consists of ten claims and seven fractional claims located on the east side of Flin Flon Lake (see plan). The ore body, as ascertained by diamond drilling, has a total length of two thousand five hundred and ninety-three feet, and has been proved to a depth of nine hundred feet over a length of one thousand feet. It will be noted from the plan that the ore body which lies in the two claims "Unique" and "Apex" is partly in Manitoba and partly in Saskatchewan, with the greater part of the ore yet proved up in the Province of Manitoba. The ore body occurs in a shear zone striking approximately northwest, with an eastward dip of 70°. The shear zone is

Camp Buildings on Flin Flon Property

in greenstone, which is in places amygdaloidal, and which is intruded by quartz porphyry on the hanging wall side. The footwall is talcose and is closely associated with a basic dyke which is apparently later than the greenstone proper. The ore deposit has been formed by replacement, which has been active in the more schisted zones, but which has not affected the more massive rock. There are thus horses of unmineralized rock throughout the ore body, one of them standing out very prominently on the "Apex" claim. Some preliminary trenching was done on the property and forty-four drill holes have been sunk, representing twenty-five thousand six hundred and sixty-four feet of drilling. As a result, the total ore body, including the solid sulphide ore and disseminated ore, has been calculated to be 16,812,290 tons, with a further tonnage of possible ore of 2,975,100 tons. The ore body may therefore be estimated to contain twenty million tons. The average assays are:

Gold	.074 oz.
Silver	1.04 oz.
Copper	1.69%
Zinc	3.49%

The central lens of solid sulphides consists of pyrite, sphalerite, chalcopyrite, magnetite, with gold and silver. The disseminated ore on the hanging wall has low values in copper and fairly high values in gold and silver. On the footwall the disseminated ore has higher values in the copper and lower values in gold and silver. When operations begin it may


1500
D.H.9 45°-180
ELEV. 896
KITCHEN & MESS
CLUB HOUSE
BUNK HOUSE
BUNK HOUSE
1400
D.H.8 30°-273
ELEV. 894
OFFICE
TRUE NORTH
MAGNETIC VAIATION
18° 30' EAST
1300
D.H.15 + 38° - 159
± 425
D.H.6 + 65° - 126
ELEV. 894.5
WARE HOUSE
D.H. 18+90°
D.H.7 + 97° - 354 ELEV. 99
Schist Lake
SURFACE OUTLINE OF MINED SULPHIDE LENS
OPEN CUT
D.H. 1. + 45° - 150'
D.H. 2. + 80° - 204'
D.H. 10. + 55° - 104'
D.H. 11. + 80° - 149'
ELEV. 899
Schist Lake
D.H 3. + 90° - 246·5
D.H. 4. + 30° - 104.5 ELEV. 900
ORE CHUTE
D.H. 19 + 90° - 732.5
ELEV 891.6
D.H. 17 + 75° 384
ELEV. 893
SHAFT
D.H.5 + 52° 30' - 123.5
ELEV. 899.1
DRILL POINT
1000
1000
POWER HOUSE
D.H. 12 + 35° - 150
ELEV. 901.
D.H. 18 + 39° - 153
ELEV. 901
D.H. 24 + 77° 479'
ELEV. 888.1
D.H. 20 + 90° - 387
ELEV 888.1
900
900
900
900
800
800
D.H. 164 35°-200'
ELEV - 889
Mandy Mining Company
Surface Plan
SHOWING
Drill-hole Locations and Projections
Shist Lake, Man.
Scale of Feet
0 20 40 60 80 100

be necessary to concentrate the disseminated ore in order to reduce cost of smelting, if a suitable concentration process can be devised.

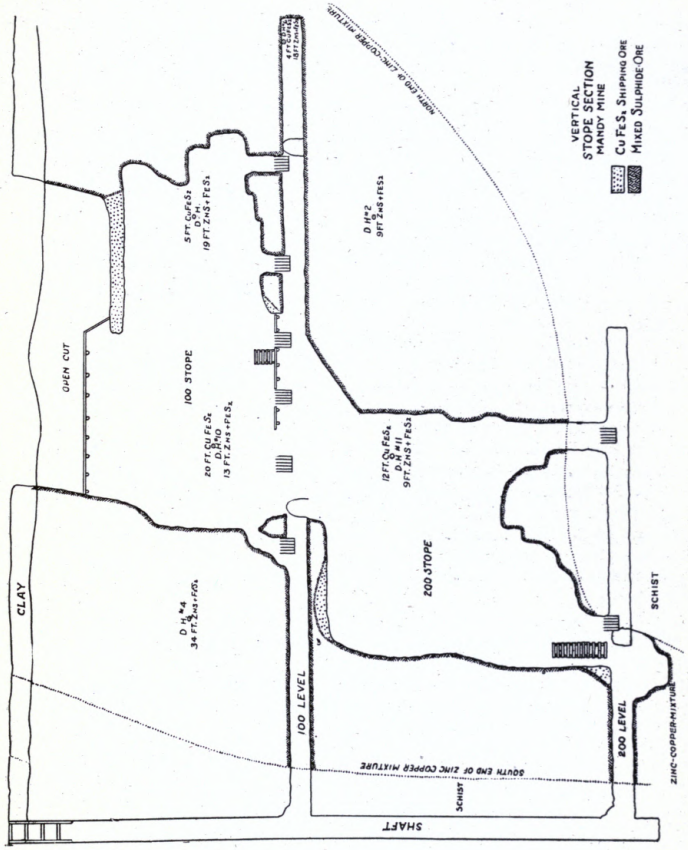
It will be necessary to build a railway approximately eighty miles in length from The Pas or some point on the Hudson Bay Railway, to erect a smelter of at least two thousand tons capacity, and, at some later stage, to develop power at the Birch Rapids on the Sturgeon River (3270 h.p. min.—5170 h.p. max.), or at Island Falls on the Churchill River (80,200 h.p. min.—131,000 h.p. max.). Fluxing material in the form of quartz and limestone will also be necessary. As far as the quartz is concerned, it will doubtless be possible to acquire one or other of the large quartz properties in the mineral belt, from which the recovery of the gold will cover the cost of handling the fluxing material. Magnesian limestone occurs in quantity within ten miles of the property.

Mandy Mine

This property is situated on the northwest arm of Schist Lake on the point immediately north of the small bay into which the creek from Phantom Lake flows. The deposit

Mandy Mining Company's Barge at Ore Pile, Sturgeon Landing

occurs on the Mandy claim in a schisted and faulted zone in the greenstone formation. In general terms, the formation and ore deposit are similar to the Flin Flon property. The dip is steeply eastwards, the footwall is highly sericitic and shows evidence of movement; the hanging wall is less distinct and less altered. As in the Flin Flon property, the massive ore is found in the middle of the deposit, and disseminated ore towards the hanging wall and footwall. The Mandy deposit is, however, remarkable is that a lens of high-grade chalcopyrite was found in the ore body near the footwall of the deposit, and in places in contact with the footwall, striking 25° east of the general strike of the ore body. This lens has now been excavated, first by open cut, later by stoping from the 100 feet and 200 feet levels, and twenty-five thousand tons of eighteen to twenty per cent ore have been transported from the mine by wagon, barge and railway car. Apart from this lens, the ore body consists of an intimate mixture of pyrite, sphalerite and chalcopyrite, the main body of pyrite and sphalerite lying east of the chalcopyrite lens. There is some evidence from the drifts at the 100-foot and 200-feet levels to indicate that while the main mass of ore was deposited in a sheared and faulted crush zone in the greenstone, the chalcopyrite lens was later precipitated in a fault zone striking 25° east of the original fault system. This lens pitches southwards with a very steep angle of pitch between


VERTICAL
STOPE SECTION
MANDY MINE
Cu FeS2 SHIPPING ORE
MIXED SULPHIDE ORE
NORTH END OF ZINC-COPPER MIXTURE
OPEN CUT
CLAY
100 STOPE
200 STOPE
100 LEVEL
200 LEVEL
SCHIST
SHAFT
SOUTH END OF ZINC COPPER MIXTURE
ZINC-COPPER-MIXTURE

125 feet and 225 feet in depth, where the lens pinched out. The average values in the chalcopyrite lens were as follows:

Copper	19%
Gold	.10 oz. per ton.
Silver	2½ oz. per ton.

It is estimated that two hundred thousand tons of mixed copper-zinc-iron sulphide ore are blocked out in the mine. This ore can not be mined under present conditions of transportation and can only be operated when a railway is built to the Flin Flon property and a smelter erected there. Details of operation and transportation are discussed on page 17.

Maybee Claim

This claim lies immediately south of the Mandy property and was staked by the group of prospectors who had already discovered the Flin Flon property prior to the discovery of the Mandy ore body. On the line which represents the continuation of the strike of the mineralization in the Mandy, a zone four feet in width was stripped on the lake shore, carrying little stringers of chalcopyrite, and veinlets four inches in width of the same ore, while over a width of twenty feet intermittent mineralization with copper and iron sulphide has been found. Three drill holes have been sunk from the east to cut the zone at depth, but without positive results. Pending negotiations on the Flin Flon property, no further work has been done on the claim.

Phantom Lake Claims

On the west side of Phantom Lake, which lies immediately west of the Mandy Mine and south of the Flin Flon group, a tongue of granite from the main mass to the south intrudes the greenstone. On the east side of the main arm of the lake some prospecting has been done. On the property of Little and Rosen, south of the Narrows, a cross-trench fifty feet long by six feet deep has been sunk in greenstone, which carries pyrite and pyrrhotite in considerable quantity. The greenstone is shot through with veinlets of epidote. Southwestwards on the same property, the quartz in very narrow shear zones carried pyrite and a little chalcopyrite, with molybdenite on the shear zones. At the south end of the lake, near the granite contact, on the Wonder Claim, a vein of quartz three feet wide has been traced for a hundred feet, and carries pyrite, small quantities of chalcopyrite, and somewhat abundant molybdenite in planes parallel to the vein wall.

Hook Lake Claims

On the Sunbeam Group, on the west side of Hook Lake, which lies west of the Inlet arm of Schist Lake and Big Island Lake, some work has been done by the Creighton-Mosher-Dion group on copper sulphide stringers in a contact acid rock near the granite, striking 338° (Mag.).[1] A pit has been sunk twelve feet deep on four stringers of mixed pyrite and chalcopyrite, the greatest width of any individual stringer being three inches. At the bottom of the pit, on the north-east corner, one of the stringers flattens out into more massive ore, and chalcocite occurs in considerable quantity mixed with the chalcopyrite. The stringers have been traced on the surface on a somewhat indefinite shear line for a distance of approximately seventy feet, the copper sulphides being weathered into the green and blue carbonates. The dip of the rock is 80° W. Some indications of copper have been found further north immediately east of the north end of Hook Lake.

LeVasseur Claim. (Northeast Arm, Schist Lake).

This shewing of mixed copper sulphide ore has been uncovered at the north end of the lake and is exposed for a distance of sixty feet into the lake. At the time of examination a pit had been sunk to a depth of six feet in a shear zone six feet in width on two stringers of mixed chalcopyrite and pyrite, respectively three inches and six inches wide. At the bottom of the pit the sulphide had widened out to a vein of thirty inches, with a higher percentage of chalcopyrite than on the surface. The dip is towards the west, and

[1] All directions of strike given in this bulletin are magnetic.

the footwall seems to dip into the hanging wall in the pit. The zone widens, however, southwards and there is a possibility that the ore pitches southwards underneath the lake. On the claim to the north (Moosehorn) the overburden of clay has been removed in a crosscut, but no indication of shear zone or ore was obtained. An option has been taken on both properties by Greenlees, who is sinking on the sulphide vein with the intention of drifting southwards underneath the lake from the thirty-five foot level in order to intercept the ore body.

Three Nations and Surprise Claims

On the west side of the north-east arm of Schist Lake, approximately a mile west of the lake, some prospecting has been done on an iron formation on which are showings of copper sulphide. Cross-trenching has been done, though not continuously, across seventy-five feet, and for at least another twenty-five feet the rusted surface indicates that the iron mineralization continues. In places the band is highly quartzose, and in the quartz scales of native copper are found. The mineralized band has been followed for several claims northwards, but very little work has yet been done to ascertain what values, if any, the rock carries.

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(2) Athapapuskow Lake District

In this district prospecting has been active mainly in the north arm and the Pineroot River area, and the north and east shores of the east arm. As in the Flin Flon and Schist Lake area search has been directed more particularly to the discovery of copper sulphide bodies. The characteristic of this district is the widespread occurrence of chalcopyrite and bornite, in bunches, stringers and isolated crystals in schisted bands in the greenstone. A good deal of surface work has been done on several such showings, while only occasionally in this district have quartz veins been discovered with indications of gold values.

Chica Claim

Near the mouth of the Pine Root River, immediately west of the rapids, a narrow zone of sheared porphyry intruded on the west side by granite and flanked on the east by conglomerate, has been impregnated by sulphides. Some cross-trenching was done in 1917 and during the summer of 1918 and 1919 a diamond drill has been continuously at work on the property. In these cross-trenches the rock is mineralized with pyrite and scattered crystals of chalcopyrite. The dip of the rock is 70° towards the west. Eight holes have now been drilled on the property, the later holes having been put down from the west at an angle of 65°. It is understood that a lens of chalcopyrite has been reached at depth on the contact between the conglomerate and porphyry. The average length of drill-hole is four hundred feet.

Eastwards from the Pine Root River and along the shore of the lake, work has been done on a series of claims in the greenstone at the margin of the granite. The mineralization is similar to that on the Chica property, but on the more northerly claims there is pyrrhotite as well as pyrite and some chalcopyrite. Work has been confined to surface trenching and some tunnelling.

Bailey-Durant Claims, East of Tartan Lake [1]

The Bailey-Durant claims extend from the first small lake below Tartan Lake eastwards to the Bird Lake. Near the westerly lake three deep trenches expose heavily iron-stained rock with little sulphide yet showing. Three trenches near the easterly lake strip a six to eight-foot band of pyrrhotite that carries some chalcopyrite.

Thompson Lake Claims

On an island at the south end of Thompson Lake, directly north of the north arm of Athapapuskow Lake, some stringers of mixed chalcopyrite and pyrite were discovered by D. Collins, late in the summer of 1919. The ore appears at the south end of the island. Practically no stripping has yet been done on this property.

[1] E. L. Bruce; Amisk-Athapapuskow Lake District, p. 77.

Properties on East Arm of Athapapuskow Lake

Several claims have been staked and a considerable amount of surface work has been done on scattered chalcopyrite and bornite showings along the north shore of the east arm of the lake. The softer schistose bands in the greenstone have been changed into an epidote rock and the bands have been mineralized with chalcopyrite and in places with bornite, the copper sulphides appearing in close proximity to, but as a rule not in, the stringers of epidote. Three parallel bands of this type have been prospected, striking in a northeasterly direction. On the most westerly are staked the Ross group, on the next the Robertson group and the Vedo claims, and on the most easterly the Cameron and Stewart groups. Several shallow pits have been sunk on the Robertson claims, and cross-trenching done on the Cameron and Stewart properties. The widest trench is the most northerly trench on the Cameron property, which is fifty feet wide and seven feet deep. The chalcopyrite and bornite are closely associated with veinlets of quartz and calcite which criss-cross the epidotized greenstone: but the bornite is subordinate in amount to the chalcopyrite. There is no indication of defined walls to the mineralized zone on any property though on the Stewart the mineralization is more definitely restricted than elsewhere. On the Vedo claims and Robertson group several pits have been sunk on a mineralized band which probably extends for three thousand feet in length. On all the properties on the north shore of the east arm of the lake the percentage values of copper in cross-channelling over any considerable width are low, and underground work should not be undertaken unless surface values are sufficiently high to permit of operation over widths of at least fifty feet.

Mandy Mine—Winter

South of the Ross group, on the "Don" claim, a quartz vein has been uncovered for forty-five feet, with a width of from twelve to twenty-four inches. Eastwards it breaks up into stringers on a fault plane. It is mineralized with pyrite and chalcopyrite. From this property some very rich samples of native gold and telluride had previously been taken.

On the line of the continuation of the lode to the northeast there is an epidotized greenstone mineralized with pyrite and some chalcopyrite and bornite.

Twin Lake District

A good deal of drifting and some trenching has been done on claims "E" and "F" in a group of claims staked on the east side of Twin Lake. The work has been done on two fine-grained reddish felsite intrusions, each approximately twenty feet wide, and carrying a little pyrite. On the more easterly claims narrow veinlets of quartz cross the felsite and carry sphalerite and galena at the bottom of a cross-trench twenty feet wide and nine

Red Rose Claim "Gold Shoot," Copper Lake

"Big Dyke," Copper Lake.

Venus Pit at Cabin Claim, Little Herb Lake.

feet deep. A good deal of unnecessary tunnelling has been done on these properties, as by surface stripping and sampling the necessary preliminary evaluation could have been obtained at a much smaller expenditure. The felsite veins are typical intrusions from the granite. Here and there quartz veins proceed from the felsite dykes.

(3) Copper and Brunne Lake Districts

Copper and Brunne Lakes form the centre of a district which may be taken as extending from the Cranberry Lake system to Elbow Lake. With the exception of a certain amount of prospecting at the narrows between the First and Second Cranberry Lakes and some work on Elbow Lake and Webb Creek, attention has been confined to Copper Lake, Brunne Lake and the southward continuation into Bear Lake. In this district quartz veins and extensive iron dykes have atrracted most attention.

"Big Dyke"

On the west side of Copper Lake, near the north end of the lake and immediately south of a beaver-dam pond, a line of five claims has been staked on a quartz lode which strikes 22° immediately east of a granite contact, the granite showing across a muskeg. On the two more northerly claims—the Contact Extension and the Contact—five cross-trenches have been dug across the lode, varying in width from thirty feet to fifteen feet. The characteristic mineralization is galena, rather finegrained and evenly distributed. Good values in gold have been obtained from the channel samples taken in the cross-trenches, with low values in silver. A rather peculiar pressure effect is shown most clearly at the north end of the lode, where the quartz, which here has a cherty aspect, breaks with a cleavage very similar to that of calcite. The dyke is exposed on the two claims for approximately two thousand feet and has not been carefully prospected on the other three claims of the group. On the fourth claim—the Soniah—the quartz appears to be more intimately mixed with greenstone in stringers and masses over a width of one hundred feet.

It is proposed to spend a considerable amount of money in the surface examination and underground prospecting of this property during the winter of 1919-1920.

Red Rose Claim

This property was staked immediately east of the Big Dyke as the result of the discovery of a very rich gold shoot in a narrow quartz vein during the summer of 1918. The shoot occupies a width of three inches on the east side of a vein which, at the point of exposure of the shoot, is eighteen inches wide. The vein dips vertically and the shoot seem to pitch northwards at a high angle, as it appears on the north wall at the bottom of a pit nine feet deep sunk on the discovery. The vein has been traced for seventy-five yards, varying in width from six inches to eighteen inches. On the shoot itself remarkably rich specimens were obtained, both on the surface and in the pit. No further work has been done on the property, and the pit sunk on the shoot has been roofed over and locked down. Further south on the Moose, on a vein eighteen to twenty-four inches in width, reduplicated folding has taken place in what is probably the same zone in which the quartz on the Red Rose claim occurs.

Bluebird Claim

Over a mile northeast from the Big Dyke, across a beaver-dam pond, and probably on the same general line of strike as the Big Dyke, some trenching has been done on a quartz vein which carries coarse grained galena, pyrite and a little chalcopyrite. One cross-trench exposes eighteen feet of quartz with some shreds of greenstone in the otherwise solid quartz. The extent of this lode has not been ascertained, the rock being concealed by a covering of clay.

Other Claims on Copper and Brunne Lakes

A series of claims ("Dominion") has been staked on a parallel line east of the "Big Dyke" and adjoining the "Jacob" claims. On this line the characteristic sulphides are molybdenite (in flakes in the fissures in the quartz) and pyrite. The width of the vein

does not as a rule exceed three and a half feet. Very little prospecting has been done. On the east side of the lake a series of iron bands has been prospected, and is found to extend southwestwards along the west side of Brunne Lake. Pyrite and pyrrhotite in varying proportions have replaced the greenstone schist and felsite in bands not uncommonly over a hundred feet in width. As a rule, the pyrite is considerably in excess of the pyrrhotite. On the Wendigo property an open quarry exposes an iron band on one side, the total width of the band being at least a hundred feet. Further east on the Bendigo and Hassett properties, bands of quartz are found in the iron dykes, the quartz carrying somewhat abundant pyrite. The leaching has been extensive and in the low ground ochre has accumulated at the bottom of the shallow ponds. North from these properties, at the northeast end of the lake, somewhat abundant free gold was found on the surface of an eleven-foot mass of quartz on the Silverbell claim, adjoining the iron dyke. The shoot was bottomed at four feet and no further work has been done.

Mandy Mining Company's Plant at Schist Lake, showing Power House, Head Frame, Barges, Etc.

Southwards the association of quartz and schist impregnated with iron sulphide continues. On the "Depth Charge" at the south end of Copper Lake, quartz bands alternate with pyritized schist in a cross-trench thirty-five feet wide. On the west side of Brunne Lake, on Gordon's claims, and particularly on the Caribou group further south, the same type of mineralization continues. On the Caribou claims the mineralization is unusually heavy. The width of the band is probably seventy-five feet, and on the west side, where some work has been done, the rock is almost solid pyrite and pyrrhotite. Values in gold, copper, nickel and platinum have been obtained but no systematic sampling has been done.

At the Narrows between First and Second Cranberry Lakes on the north side, some sinking has been done on a soft chloritic rock showing stains of copper carbonate, but with no indications of a workable body of copper ore.

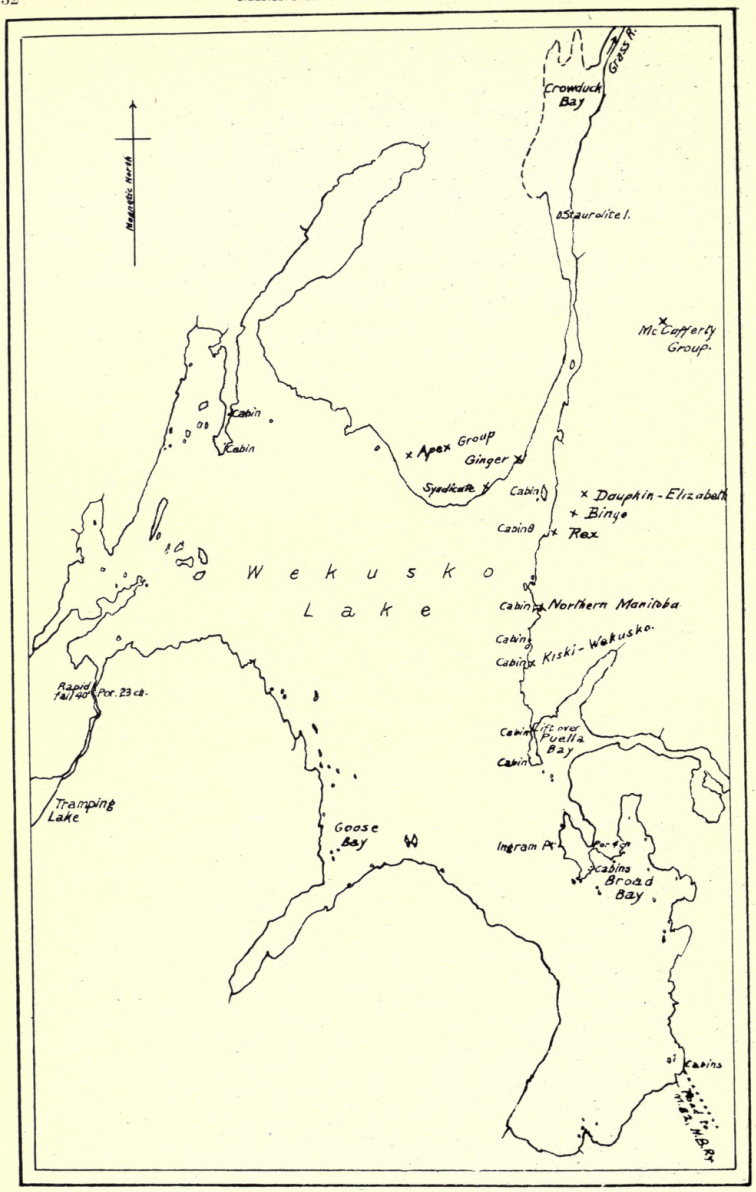
Claims on Webb Creek, North of Elbow Lake [1]

In 1916 some claims were staked on the west side of Webb Creek, which enters Elbow Lake on the west side. These claims are practically on the contract of the granite and greenstone series. The sulphide is a mixture of pyrite and pyrrhotite, the latter predominating. Gold silver and nickel values are all very low. Very little work has been done on any of these claims as most of them lie in low places. In a wet season, such as the summer of 1916, trenching is impossible. The values obtained from the grab samples of the sulphides exposed are not encouraging.

(4) The Wekusko (Herb) and Little Herb Lake District

In this district attention has been confined almost entirely to gold mining. Since 1914, when the first discoveries of gold were made in the district, there has been continuous

[1] E. L. Bruce; Amisk-Athapapuskow Lake District, p. 78.



Wekusko (Herb) Lake, Showing Mineral Properties

Scale of Miles 0 1 2 3

Outline Map by F. W. Atwood

prospecting and development work in this area. Apart from some sulphide areas on Tramping Lake, west of Herb Lake, the properties are staked on quartz veins carrying gold. A characteristic mineral in the district is arsenopyrite, usually at the margins of the veins and in the walls. Pyrite occurs distributed through the veins, while copper sulphides occur very sparingly.

On two properties in this district machinery has been installed—the "Rex" and the "Northern Manitoba" properties.

The Rex Mine

The vein, which is approximately parallel to the lake shore, has been exposed for seventeen hundred feet. The width at the surface and in the underground workings is from three and a half to five feet. The country rock is a complex of coarse sediment (in places a conglomerate), and acid lavas. The dip of the vein is forty-five degrees east. The depth of the shaft is a hundred and twenty-seven feet and the total length of drift, three hundred and fifty feet. The hanging wall is sheared while the foot wall is as a rule frozen. Ore has been removed by over-head stoping both from the north and south drifts,

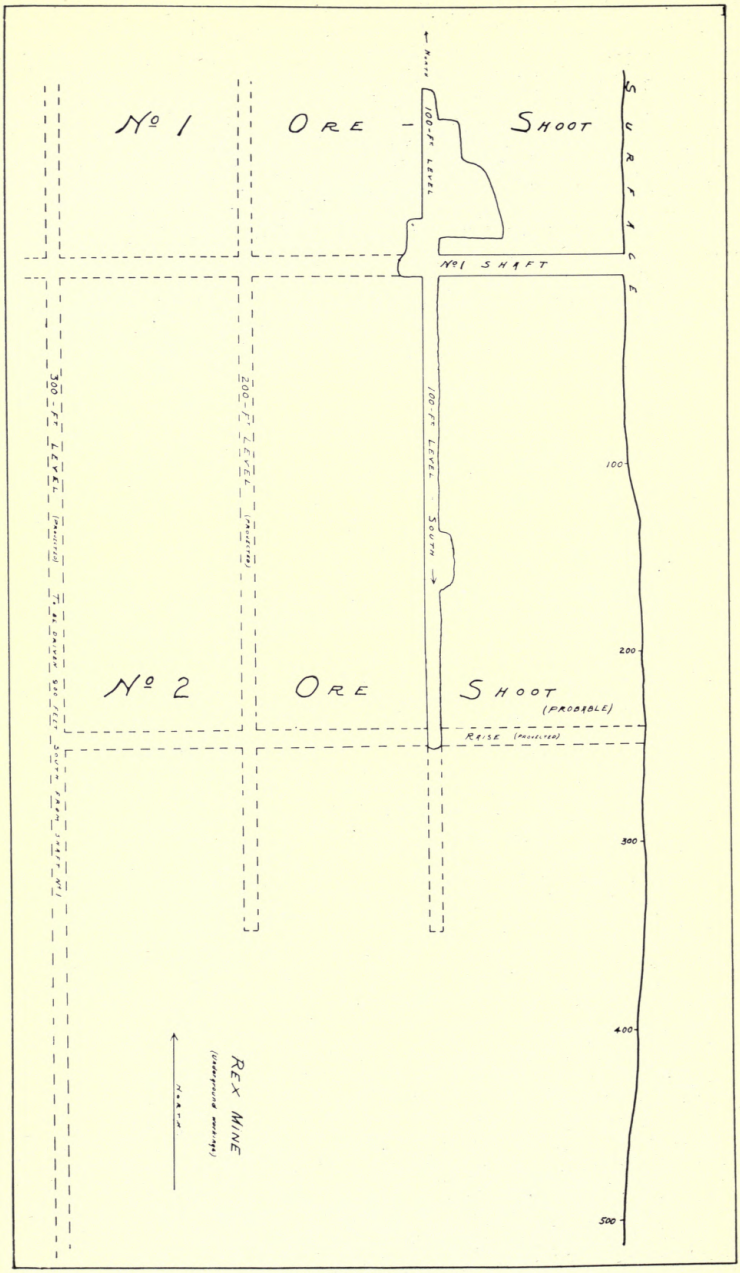
Mill at Rex Mine, Herb Lake.

the average widths of ore on the north stopes being thirty inches. The values are found in the fissures, more particularly near the hanging wall. In the quartz there is considerable arsenopyrite, a little calcite, and here and there lenses of pyrite. The equipment installed at the time is as follows:

1 Lane Mill (30 tons).
2 Amalgamating Plates.
2 Deisler Overstrom Tables.
1 60-h.p. Engine.
2 60-h.p. Boilers.
1 350-cu. ft. Compressor Plant.
Mill, Shaft and Boiler Houses.
Assay Office.
Office.
3 Bunk Houses.
1 Cookhouse.

The mill operated from May until the end of November, 1918, during which period over twenty-seven thousand dollars was recovered from the plates. The concentrates were sacked for future treatment. Mr. Walter Neal, the mine manager, estimated the recovery at approximately ninety per cent. During that period the mill worked double shift, but underground work was carried on only by single shift. The values in the shaft, shoots and surface exposures are uniformly high, and represent on the whole good widths of quartz.

Since December, 1918, no further work has been done on the property. Labor conditions, accentuated by the influenza epidemic, necessitated the closing down of the property.



Underground Plan, Rex Mine

Arrangements are in progress which, it is expected, will make it possible for the Makeever Brothers, who are operating the property, to recommence operations on this promising mine.

Northern Manitoba Property. (Moosehorn and Ballast Claims)

A vein six inches to thirty inches wide has been exposed on the surface for approximately three hundred feet. A shaft has been sunk a hundred feet on the vein, and some fifty feet of drifting has been done. The dip of the vein is sixty-five degrees east. The quartz carries high values in gold in the fissures, associated with arsenopyrite and tourmaline. There is heavy arsenopyrite in the hanging-wall to a width of six inches from the vein and here and there on the footwall as well. On the south drift there is a shear of two feet, while on the north drift the vein tends to break up into stringers. For its width the vein is very persistent to the hundred-foot level.

A carload of the ore, shipped to Trail Smelter, gave returns in gold of two thousand three hundred and twenty-three dollars for fifty-seven thousand pounds—an average of eighty-one dollars and fifty-three cents per ton. During the summer of 1918 development work was carried on under option by the Makeever Brothers and the machinery on the property consists of a 50-h.p. boiler, a 3-drill compressor-plant and a hoist. The controlling interest in the property is now being taken over by a company which intends to proceed with development work during the winter of 1919-1920.

Kiski-Wekusko Claims

The first discovery of gold on Herb Lake was made on these claims by R. Woosey and M. Hackett during the summer of 1914, the vein having been traced back from a float which was discovered on the lake shore. Altogether three veins have been stripped, and on one of the veins (No. 2) a vertical 8x6 feet shaft has been sunk to fifty-three feet. The strike of the vein is 10°. The width varies up to six feet and at the widest part of the vein north of the shaft the quartz is extensively cross-fractured.

Tourmaline occurs abundantly, mainly in irregular veinlets in the quartz. Copper pyrite, and occasionally galena, are found, but mispickel is the typical sulphide, occurring in places massive in the country rock. No. 1 vein has been exposed for a length of approximately seven hundred feet.

Dauphin-Elizabeth Claims

Northeast of the Rex property a vein has been traced southwards from the Elizabeth claim to the Dauphin claim for a distance of approximately one thousand feet. At the shaft (fifty feet deep) the vein is six feet wide on the surface and three feet wide at the bottom of the shaft. The strike of the vein at the shaft is 25°. This is a strong vein throughout, but the mineralization, as disclosed on the surface, is somewhat sparing in arsenopyrite, chalcopyrite and galena. Several veinlets have been discovered on the Elizabeth claims west, and one east, of the main vein. The country rock to the east is an acid lava, and to the west acid lava and coarse sediment. Some work was done on this property under option by the Makeever Brothers. The claims are controlled by "The Pas Consolidated Mines," who, it is understood, are acquiring options on some claims between the Dauphin and Rex properties.

Bingo Claim

An irregularly shaped fraction south of the Dauphin, on which four parallel veins have been stripped within a width of sixth feet. These veins are narrow, the main vein on which stripping and pitting has been done showing widths varying from eight inches to twenty-four inches. This vein has unusually numerous showings of gold on the surface, with a fair amount of galena in narrow parallel fissures. All the veins in this property have been carefully stripped.

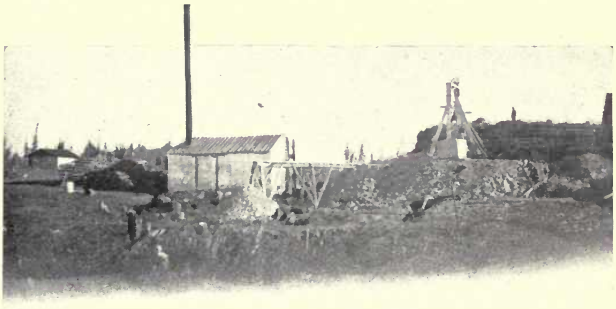
Adjoining to the north, on the Ballard property, a vein was intercepted in a trench cut twelve feet deep through the clay covering.

McCafferty Claims

The group of claims "Prince Edward," "Palmer," "Lawson" and "King George" lies east of the Narrows, south of Crowduck Bay and is reached by a trail one and a-half miles long. A double-compartment shaft has been sunk on the vein at a point where the width is eight feet, including a horse two feet in width. The vein has been carefully stripped northwards for a distance of three hundred feet, and is said to have been followed for sixteen hundred feet. Four large shacks have been built on the property and a wagon road cut through to the lake to facilitate transportation.

Ginger Claim

This property, on the west side of the entrance to the Narrows, is noteworthy owing to the fact that considerable showings of molybdenite were obtained in a quartz vein exposed near the lake. Molybdenite occurs somewhat rarely in the quartz veins in this area.



Power House and Dump, Mooschorn, Herb Lake.

Syndicate Claims

This property is staked on a narrow fringe of greenstone which forms a margin to the granite which occupies the greater part of the peninsula between the mouth of the Little Herb River and the outlet of Herb Lake. The vein is approximately parallel to the contact. Where stripped, the vein shows a width of twelve to eighteen inches, and has been uncovered by deep trenching for two hundred feet and has been followed for seven hundred feet. A vertical shaft has been sunk on this property. The quartz is a somewhat peculiar milky variety with relatively little sulphide, but a fairly considerable amount of iron carbonate. Good specimens of gold have been obtained from this vein.

Apex Group

This group of claims (Apex, Dawson, Victoria, Discovery and Pine Ridge) is of interest in two respects. The claims are located well within the granite area, and the mineralization occurs not in well-defined veins, but in a somewhat indefinite arclike zone. In what appears to be a line of weakness in the granite, extensive silicification has taken place, and arsenopyrite, pyrite and some chalcopyrite with gold have been deposited with the silica. The greatest width of silicification is found in the Apex and Dawson claims, where the mineralized area has been prospected for one thousand feet, the width averaging from fifteen to twenty feet, with a greatest width in trenching of sixty feet. Values in channel sampling are reported to range from $1.50 to $24.00 in gold. On the Discovery a pit has been sunk in a narrow quartz vein the connection of which with the main vein cannot be traced owing to an intervening muskeg. Free gold is found in this vein.

The extent of the mineral zone is such that very complete surface assays and underground prospecting will be required in order to determine the extent of the ore body.

Eastwards from the Apex group, and further from the contact, other quartz veins have been prospected. Such veins (as on the Gold Reef) follow somewhat definitely the shear direction of the granite, and are of doubtful lateral continuity.

Cabin Claim (Little Herb Lake)

Several claims have been staked on both sides of the north arm of Little Herb Lake, in the narrow strip of greenstone between the lake shore and the granite contact. The only property on which any work has been done is the Cabin claim, on which a pit twelve feet deep has been sunk on a vein which dips seventy degrees east. The pit was sunk on four veinlets which converge at the bottom of the pit to a quartz lode thirty inches wide, heavily mineralized on the hanging-wall with pyrite, and throughout with chalcopyrite and bornite. In the pit the quartz is a transparent glassy variety. Sulphides, both of iron and copper, occur also in the horn-blende schist, and gold has also been found in the schist, which is very much decomposed. The vein has been followed two hundred and fifty feet, and south of the pit the quartz is associated with iron carbonate in considerable quantity. The quartz is here a milky variety, very different from the variety in the vein in the bottom of the pit.

Tramping (Sandy) Lake Claims

On the east end of Tramping Lake, on the south side of the lake, some claims have been staked and trenching has been done, on an iron sulphide band immediately south of the granite contact. The sulphides are pyrite and pyrrhotite, the latter predominating. An option was taken on the property by the Tonopah Mining Co. and a good deal of surface work has been done on the claims. Values on the surface are low.

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(5) Wintering Lake, Pipe Lake and Hudson Bay Railway District

Some claims were staked on Wintering Lake by one of the earliest parties of prospectors, but little work has been done in this area since that time. The rock is a reddish granite, streaked with grey granite, and very gneissose. Little stringers of chalcopyrite occur in shear zones, and on these stringers the claims have been staked. Only shreds of greenstone occur in the gneissose granite.

On Pipe Lake a band of greenstone strikes 120 degrees with a wide contact zone on both sides. The contact formation is interbanded gneiss and greenstone, each band well defined, with little evidence of intrusive relationships. On the islands at the northeast end of the lake are narrow veins of quartz which have been staked and on which some stripping has been done. The veins vary in width up to eighteen inches. The quartz carries very little sulphides, but low values in gold are reported from assays. On the west side of the lake a body of pyrrhotite has been located and is now being prospected.

Some prospecting has been done at points in the vicinity of the Hudson Bay Railway, at Halfway Lake, near Mile 196, and south of Manitou Rapids. The greenstone, where it does occur, is very limited in extent. Where work has been done the mineralization is magnetite, pyrrhotite, a little chalcopyrite, with low values in nickel and gold. Prospectors have been attracted rather by the favorable situation for transportation than by the extent of mineralized rock so far discovered.

(B) Other Mineral Areas

On Pipestone Lake, on the Nelson waterway, is a marginal belt of greenstone, which extends northwestwards over part of Cross Lake and which may be continuous with the band mapped on the Echimamish River. Another band is mapped on Oxford and Knee Lakes on the Hayes River road, and isolated areas on God's and Island Lakes. Very little prospecting has yet been done in these areas. On Pipestone Lake some claims were staked several years ago by Mr. Hyer of Norway House, and values in gold and silver have been obtained on assay. Claims were also staked by Mr. Hyer on Oxford Lake, while on the north shore of Knee Lake a mineralized zone was stripped by H. Paull in 1917-18. These districts have not been examined by the writer and full details cannot be given. It is noteworthy that the first report of metallic mineral in Northern Manitoba is from the Knee Lake district, from which Dr. Edwards described an iron ore in 1812.

During the past summer (1919) Dr. F. J. Alcock has investigated the Pipestone-Cross Lake area, and Dr. E. L. Bruce the Oxford-Knee Lake area for the Geological Survey of Canada.

CHAPTER V.

NON-METALLIC DEPOSITS

The non-metallic deposits may be considered under three headings:

(1) Structural materials.
(2) Fuels
(3) Other Deposits.

(1) Structural Materials

The newer granites of Precambrian age are normally fresh, and are in many localities unaffected by shearing. Were there a demand for building stone in the district this granite might be utilized to advantage. In one building of considerable dimensions has the granite boulder been used as the principal building material—the Roman Catholic Industrial School at Cross Lake. The demand is, however, very small for this class of material.

It will be remembered that limestones flank the Precambrian formation both southwestwards and northeastwards. With the exception of certain divisions of the Devonian formation, which forms the prominent cliffs on the west side of Dawson Bay, Lake Winnipegosis, these limestones contain such a high percentage of magnesia that they may more properly be called dolomites. The Ordovician horizon, where exposed in the somewhat prominent escarpment facing the Precambrian floor is thin bedded and of little value for building purposes. In some of the exposures on Cormorant Lake and the north end of Moose Lake, however, more heavily bedded limestone is found, which might be utilized for structural purposes. The Silurian dolomites, exposed on the Saskatchewan River and tributary lakes, is extremely thin bedded and of little value structurally. A harsh Dolomite (Stringocephalus burtoni zone) exposed on Dawson Bay, is fairly heavily bedded, but would be an expensive stone to work owing to its hardness. The highest Devonian horizon, as exposed at Port Wilkins, Dawson Bay, is a thin bedded mestone, which owing to its purity might be used as the basis for Portland cement, and which would produce an excellent grade of lime. Limestone has not yet been utilized commercially in Northern Manitoba.

In the Pasquia Hills, at the southwestern corner of the Northern Manitoba area, several horizons of Cretaceous shales are exposed, which may furnish the materials for a brick industry. The experience of brick manufacturers in the southern part of the Province has been that the Cretaceous shales in themselves are somewhat unsuited to brick manufacture in that the bricks shrink on drying to too great an extent, and that an admixture of suitable surface clays with the shales leads to better results. To date there has been no demand for bricks sufficient to justify experimenting with the shales on the Pasquia escarpment.

Surface clays are widely distributed. Along the route of the Hudson Bay Railway from Mile 110 to the second crossing of the Nelson River, lake clays are exposed on several of the railway cuttings. A sample taken at Mile 214 by W. A. Johnston of the Geological Survey in 1917 was analysed by J. Keele, who reported that the clay might be suitable for field drain tile, and that the addition of sand would lessen the shrinkage on drying. Similar clays extend northward beyond the Burntwood River and westwards to Burntwood Lake.

The brickmaking industry has not yet been established at any point in this territory.

(2) Fuels.

Coal has not been found in workable quality in this area. In the Dakota sandstone at the base of the Cretaceous formation, thin bands of lignite have been noted. The formation is exposed on the Red Deer River west of Red Deer Lake. Discoveries of lignite have been reported from the Pasquia Hills on the Saskatchewan side of the boundary line, but no deposit has yet been found in place. There is a possibility that the Estevan lignite horizon may be represented at the top of the Pasquia Hills. This could best be ascertained by drilling, as the clay covering conceals the rock surface.

There is a wide distribution of peat in Northern Manitoba. Investigations have not been carried out to determine the extent of the peat bogs and the thickness of the available fuel. North of Grand Rapids, on the west side of Lake Winnipeg; between the Pasquia River and the Overflowing River; between the Grass River and Beaver House Lake on the Burntwood River, are some of the many muskeg areas in the territory. Generally speaking, the main streams drain their basin to a width of half a mile on either side. Beyond this strip lies muskeg country, with swamp vegetation which on decomposition would give rise to beds of peat. Decomposition is, however, retarded by the low temperatures which are maintained in swamp areas, even to the close of the hot summer months. On the sections which are exposed by railway cutting or on the banks of the streams is shewn undecomposed moss to considerable depths. Experimental work is being carried on in the Province of Ontario and elsewhere in order to demonstrate processes of peat-making which can be operated at a profit. When the industry is established, opportunities

Herb Lake Road—a Stretch of Muskeg.

will doubtless present themselves in this territory near the C. N. Railway line from Hudson Bay Junction to The Pas, or at selected points on the Hudson Bay Railway.

Considerable interest has been taken in the possibilities of oil in the Pasquia Hills, whether from the distillation of bituminous shales or from wells. The shales are exposed in scarps on tributaries of the Carrot and Pasquia Rivers in Saskatchewan territory, and are probably not represented on the Northern Manitoba side of the boundary line, as the elevation within Manitoba is comparatively low. The shales, which have been referred to the Niobrara horizon of the Cretaceous are interbedded with thin bands of fossiliferous limestone. Sufficient field work has not yet been done on the shales to determine whether distillation processes are economically possible, or whether folds exist which may serve as a guide in drilling for oil reservoirs. Within Northern Manitoba territory, near Turnberry, some indications of oil have been found in springs at the foot of the escarpment and several oil claims have already been staked in the vicinity of the springs.

(3) Other Deposits

Reference has already been made in the discussion of the history of mining development to the recovery of an amber-like material on the west shores of Cedar Lake, and to the manufacture of salt from the waters of the brine springs on the west shores of Dawson Bay. These industries have only a historical significance. The so-called amber is apparently not of commercial value, while the salt industry was unable to survive after it became possible to import salt from the east. One of the most important brine springs of the whole salt belt is within Northern Manitoba Territory, on Salt Point, on the west side of Dawson Bay. The percentage of salt in the brine is low and the salt industry could only be possible as an adjunct to some other business, such as lumbering, where the exhaust steam from the sawmill might be utilized to evaporate the water. There is not a sufficient percentage of potash in the brine to admit of extraction.

CHAPTER VI.

THE ECONOMIC SITUATION

With regard to the mineral belt north of The Pas the following conclusions, given in a report on "Progress in the Northern Manitoba Mineral Belt," issued in September, 1919, are substantially applicable to the present situation:

"(1) The work of the past five years may be characterized as very successful prospecting. In order that successful mining may ensue, railway transportation is essential. Until such transportation is provided, mining operations will be difficult on the gold properties and impossible on the copper properties in the western section of the district.

"While the extent of the Flin Flon property in itself justifies the building of a railway, it is very desirable, from the point of view of the mineral belt as a whole, that that railway should cross the belt east of Lake Athapapuskow and reach the property from the east, and in this way place a comparatively large section of the mineral belt in direct touch with transportation. When negotiations are finally concluded on the Flin Flon property the building of the railway cannot be any longer delayed.

"(2) While in the search for copper properties no discoveries have yet been made comparable to the Flin Flon and Mandy properties, prospecting has revealed a very widespread occurrence of copper sulphides throughout the mineral belt, and more particularly on the western section. There is therefore ample encouragement for still further and more detailed prospecting for copper ore bodies in the mineral belt and, in certain instances, for the expenditure of capital in the underground prospecting of properties already obtained.

"(3) As far as gold mining is concerned, interest now centres more especially on unusually large gold-bearing quartz lodes and silicified zones on the Copper and Herb Lake districts. Much money will require to be spent on the underground prospecting of these and similar large properties. With the stimulus which gold mining is now experiencing throughout the continent, it cannot be doubted that the money will readily be spent by such mining corporations as are desirous of acquiring ore bodies of large dimensions with sufficiently high surface values to justify underground prospecting on a large scale.

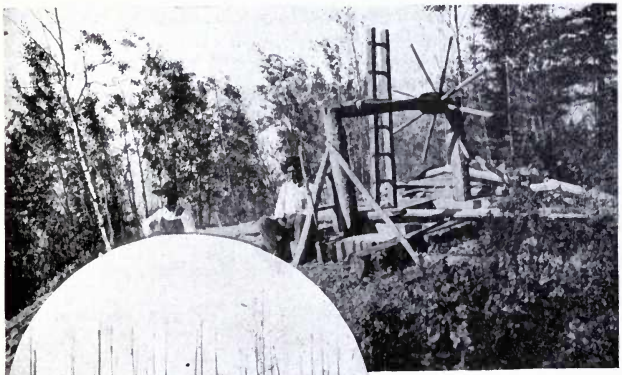
"(4) Throughout the belt the iron sulphide bands are remarkable both in respect of distribution and width. Such bands have been cross-channel assayed only to a very limited extent. Because of their extent, and also because of the fact that fairly wide quartz lodes are here and there closely associated with the iron sulphides, careful attention should be paid to these occurrences, in order to determine whether sufficient quantities of copper, nickel, gold and platinum are present in any such occurrence to make operations profitable on a mineral body of large dimensions.

"(5) It cannot be too strongly emphasized that the staking of claims must be followed by, and indeed preceded by, intensive prospecting, if good results are to follow to the district as a whole. In certain areas the actual work done is as yet entirely incommensurate with the amount of territory which, being already staked, is no longer available for prospecting by anyone but the owners of the claims. The regulations with regard to staking and assessment work are very favorable, and not the minimum but the maximum of work will always be done on the claims recorded by those who keep the welfare of the district closely to heart."

With the exception of the Herb Lake area, which is not to any great extent dependent on operations elsewhere, the key to the mining situation in the whole mineral belt is the Flin Flon property. Negotiations have been in progress for several months for the sale of this property to American mining interests. If a sale is effected a railway will of necessity be constructed to the property in order that a smelter may be erected and the necessary fuel be transported to the smelter. It will then be possible to resume operations at the Mandy property, and surface and underground prospecting will become general in the whole belt between Copper Lake and Flin Flon Lake. Particularly in the case of copper sulphides, close prospecting is necessary, as disintegration has been rapid, and clay-covered valleys may demand as careful a search as the exposed rock surface.

In the eastern (Herb Lake) section, where prospecting has been mainly for gold, mining has been hampered by the difficult labour market and the high price of materials and supplies. The labour situation is gradually being relieved but the gold mining industry will be faced for some time with high costs both of labour and materials. There are no serious difficulties in connection with transportation as far as this section of the mineral belt is concerned. Two of the properties have been partially proved up and have adequate machinery for development already installed, while several others are partially prospected and offer prospects of successful development. Indications point to a period of activity in gold mining throughout the whole country, and there is no doubt that the Herb Lake section will participate very actively in this movement.

Development in the whole mineral belt has been in the hands of responsible mining companies. Up to date only a limited amount of stock has been issued locally, and there has, to date of writing, been very little company promotion which was not justified by the surface values of the properties which were being developed. Here, as elsewhere, there is a place for development companies which are willing to open up properties of promise to a stage where the operating mining companies will take them over. It frequently occurs that the prospectors who have discovered the claims are not financially in a position to do enough work on their properties to satisfy the representatives of mining corporations that they can secure sufficient data to afford a basis for negotiation. Much time would be saved if this phase of the work were handled by independent development companies.



Shaft Syndicate Claim, Herb Lake.

Shaft Elizabeth Claim, Herb Lake.

CHAPTER VII.

BIBLIOGRAPHY

Alcock, F. J.....Lower Churchill River Region, Manitoba. Geol. Surv. Can., Summary Report, 1916, p. 133.
Wekusko Lake Area, Northern Manitoba. Geol. Surv. Can., Summary Report, 1917, 8D.
Reed-File Lake Area, Northern Manitoba. Geol. Surv. Can., Summary Report, 1918, 6D.
Wekusko Lake Area, Manitoba. Geol. Surv. Can., Summary Report, 1918, 9D.

Bancroft, C. R.....Prospecting Opportunities in Northern Manitoba. Bull. Can. Min. Inst., July, 1919, p. 719.

Bell, R.....Report on Progress, Geol. Surv. Can., 1877-78, part C.C.
Report on Progress, Geol. Surv. Can., 1878-79, part C.

Brock, R. W.....Geol. Surv. Can., Summary Report, 1910, p. 14.

Bruce, E. L.....A New Gold Area in Northern Saskatchewan and Manitoba. Can. Mining Inst. Trans. Vol. XVIII., p. 174.
Amisk-Athapapuskow Lake Area. Summary Report, 1915. Geol. Surv. Can.
Schist Lake and Wekusko Lake Areas. Summary Report, 1916. Geol. Surv. Can.
Preliminary Map Amisk-Athapapuskow Lakes Map No. 1692. Geol. Surv. Can.
Metal Mining in Northern Manitoba in 1917. Can. Mining Jl. Dec. 15th, 1917, p. 476.
Mining in Northern Manitoba. Bull. Can. Min. Inst., March, 1918.
Prospecting Areas in Manitoba. Man. Public Service Bulletin, June, 1918.
Schist Lake Area, Northern Manitoba. Geol. Surv. Can. Summary Rept., 1917. 1D.
Athapapuskow Lake District. Geol. Surv. Can., Summary Report, 1918, 1D.
District Lying Between Reed Lake and Elbow Lake. Geol. Surv. Can., Summary Report, 1918, 2D.

Callinan, J. W.....Flin Flon Copper District. Eng. & Mining, Jl, Feb. 17, 1917, p. 303.

Campbell, J. A.....Northern Manitoba, Nov. 1917.
Manitoba's Northland, Nov. 1918.
Northern Manitoba Mineral Belt. Man. Public Service Bulletin, July, 1918.
The Northern Copper Country. Man. Public Service Bulletin, August and Oct., 1918.

Campbell, C. M.....Resources and Characteristics of Northern Manitoba, July, 1919.

Chambers, E. J.....The Unexploited West, 1914.

DeLury, J. S.....The Mineral Belt North of The Pas, Manitoba. Can. Mining Journal, Vol. XXXVII, p. 412.
Recent Developments in Manitoba. Can. Mining Journal, Sept. 24, 1919, p. 712.

DeLury, J. S., with
Wallace, R. C.....Mineral Belt North of The Pas, Manitoba. Public Utilities Commission Report, 1916.

Dobbs, S.....Summary Report. Geol. Surv. Can., 1905, p. 73.

Dowling, D. B.....Annual Rept. Geol. Surv. Can., 1898, Pt. G.
Annual Rept. Geol. Surv. Can., 1900, Pt. FF.

Hind, H. Y.....Narrative of the Canadian Red River Exploring Expedition of 1857. London, 1860.

Johnston, W. A.....Reconnaisance Soil Survey of the area along the Hudson Bay Railway. Summary Report, 1917, 25D.

Karri-Davis, Walter.....A New Canadian Mining District. Min. & Scientific Press, Oct. 13, 1917, p. 534.

Kitto, F. H. .....The New Manitoba District, 1918.
Athabaska to the Bay, 1919. (Issued by National Resources Intelligence Branch, Dept. of Interior).

Macoun, John.....Manitoba and the Great Northwest.

McInnis, W.....Geol. Surv. Can. Summary Report, 1910, p. 168.
Basins of Churchill and Nelson Rivers. Mem. 30. Geol. Surv. Can. (with map).

Parks, W. A.....Building Stones of Canada. Vol. IV, 1916. (Mines Branch, Dept. of Mines).

Tyrrell, J. B.....Annual Rept. Geol. Surv. Can., 1898. Pt. G.
Annual Rept. Geol. Surv. Can., 1900. Pt. F.
Annual Rept. Geol. Surv. Can., 1902. Pt. F.
"Thompson's Narrative of his explorations in Western America." Champlain Society.
Hudson Bay Exploring Expedition, 1912. 22nd Report, Ontario Bureau of Mines, 1913.
Notes on the Geology of Nelson and Hayes Rivers. Trans. Royal Soc. Can., 1916. p. 1.

Richardson, Sir John.....“Arctic Searching Expedition,” London, 1851.

Wallace, R. C.....Gypsum and Brines in Manitoba. Summary Report Geol. Surv. Can., 1914, p. 73.
Sulphide Deposits of Flin Flon and Schist Lakes, Manitoba. Can. Min. Jl., Vol. XXXVII, p. 468.
Manitoba Gold Belt Prospects. Eng. & Mining Jl., Vol. 102, p. 332.
The Resources of Manitoba and their Development. Nov. 1918.
Annual Mining Reviews. Bulletin Can. Mining Inst. and Eng. & Mining Jl., Jan. 1917, 1918, 1919.
The Gold Discovery at Copper Lake, Manitoba. Can. Mining Jl., Oct. 1, 1919, p. 731.
Progress in the Northern Manitoba Mineral Belt. Man. Public Service Bulletin.

Wallace, R. C., with
DeLury J. S.....Mineral Belt North of The Pas. Manitoba Public Utilities Commission Rept., 1916.

APPENDIX.

*SYNOPSIS OF REGULATIONS GOVERNING THE GRANTING OF MINERAL RIGHTS

Coal:—Coal mining rights may be leased for a period of twenty-one years (21) years, renewable at an annual rental of One Dollar ($1) an acre. Not more than 2560 acres shall be leased to one applicant. A royalty at the rate of five cents (5c) per ton shall be collected on the merchantable coal mined.

A fee of Five Dollars ($5) shall accompany each application for a lease. This fee will be refunded if the rights applied for are not available, but not otherwise.

Petroleum and Natural Gas:—The petroleum and natural gas rights which are the property of the Crown may be leased to applicants at a rental of twenty-five cents (25c) per acre, for the first year, and for each subsequent year a rental at the rate of fifty cents (50c) an acre, payable yearly in advance. The term of lease shall be twenty-one (21) years, renewable for a further term of twenty-one (21) years.

Application for a lease shall be made by the applicant in person to the Agent of Dominion Lands for the district in which the rights applied for are situated, or to a sub-agent for such district for transmission to the Agent. In case the location is in unsurveyed territory it shall be staked out by the applicant in person.

A fee of Five Dollars ($5) and the rental for the first year shall accompany each application for a lease. This fee and rental will be refunded if the rights applied for are not available, but not otherwise.

Placer Mining:—Any person over eighteen (18) years of age may enter for mining purposes, locate, prospect and mine for minerals upon any lands the right to which entry, prospecting and mining is vested in or reserved to the Crown, except lands within the boundaries of a city, town or village, as defined by any provincial law or ordinance or specified by the Minister or lands occupied by a building, or within the curtilage of a dwelling house, or lands lawfully occupied for placer mining purposes, or which form part of an Indian or other reservation.

An application for a grant of a claim shall be filed with the mining recorder within ten (10) days after the location thereof, if the claim is located within ten (10) miles of the mining recorder's office.

One (1) extra day shall be allowed for every additional ten (10) miles or fraction thereof.

Limestone, Granite, Slate, Marble, Gypsum, Marl, Gravel, Sand, Clay or any Building Stone:—Dominion lands containing limestone, granite, slate, marble, gypsum, marl, gravel, sand, clay or any building stone may be leased by the Minister at an annual rental of One Dollar ($1) per acre, payable yearly in advance, for the purpose of quarrying out and removing therefrom stone or other material mentioned herein.

The term of the lease shall be twenty-one (21) years, renewable for a further period of twenty-one (21) years.

The maximum area of a quarrying location shall be forty (40) acres, and no person shall be allowed to locate more than one (1) location.

Application for a location comprising surveyed land shall be filed by the locator in person with the Agent of Dominion Lands for the district in which the location is situated. In unsurveyed territory no location is to be staked out.

A fee of Five Dollars ($5) shall accompany each application for a lease. This fee will be refunded if the rights applied for are not available, but not otherwise.

*. Abstract from "Natural Resources (Manitoba, Saskatchewan, Alberta)" Natural Resources Intelligence Branch, Dept. of Interior, 1919.

Quartz Mining:—Any person having discovered mineral in place may locate a claim 1500 by 1500 feet by staking out the same with three (3) legal posts, one at each end of the location line, and a third at the spot where the mineral in place had been discovered. The two (2) location posts must have the name of the claim, a description of the ground, date of location and locator's full name written legibly upon them. The discovery post shall be marked "Discovery Post," and No. 1 post marked "Initial Post."

The claim shall be recorded within fifteen (15) days if located within ten (10) miles of a Mining Recorder's Office; one (1) additional day allowed for every additional ten (10) miles or fraction thereof. The fee for recording a claim is Five Dollars ($5).

At least One Hundred Dollars ($100) must be expended on the claim each year or paid to the Mining Recorder in lieu thereof. When Five Hundred Dollars ($500) has been expended or paid, the locator may, upon having a survey made, and upon complying with other requirements, lease the land, and permission may be granted to group any number of adjoining claims up to eight (8) in number for representation work, upon taking out a certificate of partnership before the commencement of the work.

If any person satisfies the recorder that he is about to undertake a *bona fide* prospecting trip and files a power of attorney from any member or person not exceeding two (2) authorizing him to stake claims for them in consideration of their having enabled him to undertake the trip, he may stake one (1) claim in the name of each such person upon any lode or vein which he may discover.

There are also regulations governing the issue of leases to dredge for minerals in the beds of rivers, and regulations governing the leasing of deposits of potash on Dominion lands.

Clay:—Clay locations are leased upon the condition that the plant suitable for the manufacture of brick or other clay products shall be erected within two (2) years from the date of the lease, and further that in each year of the term of the lease after the second year there shall be produced ready for shipment not less than One Hundred Thousand (100,000) bricks or their equivalent in some other form.

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